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Case Study: Applying Lean Manufacturing Principles to the Prep Process of the Hurricane Island Outward Bound School

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CASE STUDY: APPLYING LEAN MANUFACTURING PRINCIPLES TO THE PREP PROCESS OF THE HURRICANE ISLAND OUTWARD BOUND SCHOOL

by
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ABSTRACT

BEN BRANSON: Case study: Applying lean manufacturing principles to the prep process of the Hurricane Island Outward Bound School

(Under direction of Dr. Jack McClurg)

This study synthesizes the author's area of education and occupational passions by applying lean manufacturing principles such as those of the Toyota Production System to the course preparation process at the Hurricane Island Outward Bound School. Over four weeks in the summer of 2017, the initial conditions were monitored and changes were implemented in both the layout of the base and the process itself, specifically the logistics portions. At the end of the season, the effectiveness of these changes were evaluated through a staff survey and comparison of evidence gathered during the summer. The time needed for prep logistics was reduced by 25%, from 6.2 hours to 4.6 hours. The checklists used and layout of storage spaces also show improvements in standardization and clarity. This proved the effectiveness of manufacturing principles in environments outside of traditional production lines, and further improvements are described for continuation of this study's work.

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CHAPTER 1: INTRODUCTION

During the summer of 2016, I worked as the logistics intern for the Hurricane Island Outward Bound School (HIOBS). I thoroughly enjoyed working in coastal Maine and helping instructors prepare for their expeditions. As I grew accustomed to the logistics systems and organization, I wondered if aspects of my manufacturing education could be used to improve the working conditions, which were often stressful for time-strapped instructors and logisticians. While I had hands-on experience evaluating factory floor operations as part of the Center for Manufacturing Excellence (CME) at The University of Mississippi, I wanted to know how relevant these ideas and strategies were in a different environment. For the summer of 2017, I set out to perform my capstone research on the following question:

> "How can manufacturing principles such as TPS and 5S be applied to the HIOBS prep process to reduce the time instructors spend on logistics and increase standardization?"

A. Hurricane Island Outward Bound School

To understand the significance of this study, a basic understanding of HIOBS is handy. Outward Bound was founded during WWII as a training program for young sailors in the British merchant marine. After losing many lifeboats of sailors, Lawrence Holt of the Blue Funnel Line (a shipping company) surmised that these young men didn't have the

strength of character to survive in less-than-ideal conditions. He approached Kurt Hahn about creating a school that could prepare sailors for the rigors of the sea ["Outward Bound" 1]. Hahn had previously founded two boarding schools, Salem School and the Gordonstoun School, and his curriculum focused on aspects such as "sense of justice," "ability to plan," and "physical exercises" in addition to the traditional academic subject matters. His idea was "training for and through the sea" [Hahn 4].

The Outward Bound school was a success, and in 1962 the idea was exported to the United States by Josh Miner, who started the Colorado Outward Bound School focused on mountaineering. Soon after, Peter Willauer founded HIOBS in 1965 on the namesake island in the Penobscot Bay of Maine. Formerly a granite mining site, Hurricane Island became the base for a fleet of over 15 boats used for instructional courses throughout the summer. However, working from an island posed serious logistical issues, and the school moved to its current location at Wheeler Bay in 2000 [HIOBS 1].

The Wheeler Bay facility is located on an old granite quarry site and includes staff housing, boathouses, a stone pier, a pier building, a boat ramp, and a floating dock. This means that all operations, from boat maintenance to course start and logistics, can be performed on site. Though the program has a smaller operational fleet of 6 to 8 educational boats, HIOBS still runs over 40 sailing courses per summer from this sea base. In addition, there is a land base in Newry, Maine for backpacking and canoeing, and a sea base in Big Pine Key, Florida for winter sailing. Though there is operational crossover between bases, this study will focus primarily on Wheeler Bay.

The sailing courses are all expedition-based, meaning that students are on their boat for 3 to 20 days without returning to Wheeler Bay. Led by two instructors, a crew of up to

eleven students learn to sail, navigate, cook, and live on an open boat. In addition, they rotate through leadership roles, respond to challenges, and develop their communication skills. Challenges can be physical (rowing, daily swim in 50° water), mental (sleep deprivation, new skills), or emotional (new social environment, failure). Instructors structure the course to push students every day, and the students' development from beginning to end is noticeable.

There are a number of challenging elements, some as a result of course structure and others inherent to the uncontrollability of wilderness expeditions. The pulling boats are spartan but robust – they are 30 feet long, open-top sailboats that can be rowed in absence of wind [Figure 1.1]. The crew lives in this small space for the duration of the voyage. All of their food, clothing, sailing equipment, shelter, and safety gear are stored onboard. The weather is also a significant factor, whether it brings fog, high winds and waves, dead calm, heat, rain, or cold. All of these elements make the course meaningful and can be utilized constructively, but without correct preparation they can be difficult to manage.

Figure 1.1: A HIOBS pulling boat in a calm bay

Instructors spend two days before every course preparing for their expedition. They are guided by their Course Director (CD) and assisted by a Logistics Coordinator (LC). During this process, they inspect every piece of gear on their vessel, plan the route and curriculum, and pack all of the food and student gear necessary. In addition, they spend time getting to know each other, since instructor pairs are often a new combination. A more experienced Lead Instructor who has their US Coast Guard captain's license is paired with an Assistant Instructor who may or may not have experience leading student expeditions. Their CD is their supervisor for the course, and he or she will be responsible for handling emergencies and organizing resupplies. The relationships developed during these two days by instructors and CDs are critical for managing and teaching students.

B. Lean Manufacturing Principles

The Haley Barbour Center for Manufacturing Excellence (CME) at the University of Mississippi connects the traditional studies of engineering, business, and accounting to address the complex topic of manufacturing. By using a cross-disciplinary approach, engineering students can consider costs and communicate their ideas more effectively, and accountants can understand what parts of a design are critical and which can be optimized for cost. Furthermore, the CME teaches hands-on classes on manufacturing principles such as the Toyota Production System (TPS), 5S, and the various other principles associated with optimizing production.

The founding father of TPS was Taiichi Ohno, an industrial engineer who worked for Toyoda Boshoku and Toyota Motors. As he pushed to match his factories' productivity with that of his American rivals, Ohno developed a complete system to streamline the

workplace, or *gemba*. His book *Workplace Management* contains his thoughts behind many of the principles in TPS. Of major note are his concepts of "just-in-time," *jidoka*, and *kaizen*. There are others that he discusses as well, such as his 7 wastes, 4S, and *kanban* [Ohno xi].

In Ohno's words, the simplest definition of TPS is to "produce what you need, only as much as you need, when you need" [Ohno xii]. Though this incorporates many TPS elements, it most exemplifies the concept of "just-in-time." By using customer demand or pull as the basis for production, the possibility for waste is eliminated. The customer is not necessarily who receives the finished good, only who receives the result of the current process. Thus, there are many customers in production, and each process only needs to produce what its customer needs. This system relies heavily on *kanban*, the signal that the consumer uses to state their demand. This can be implemented in a number of ways, whether it is *kanban* cards, empty space, or verbal communication.

Another of Ohno's concepts is *jidoka*, or "automation with a human element" [Ohno 61]. Machines that do work are only useful until they produce defects. When that happens, they are creating waste. By stopping production before a defect is made, cost is reduced and the source of the defect may be easier to detect. This activates another feature of TPS called *kaizen*, or continuous improvement. In each instance where a defect is found, steps can be taken to eliminate that same defect in the future. In this manner, *jidoka* preserves quality and *kaizen* improves efficiency.

Kaizen is also crucial in eliminating the 7 *muda*, or wastes, identified by Ohno [Table 1.1]. These include overproduction, waiting, transportation, inappropriate processing, excessive inventory, unnecessary motion, and defects. He argues that over-

processing is the most costly, as it can lead to all of the others as well. In the workplace, it is important to identify these wastes and ask why they exist. From there, their causes can be addressed and the waste will be eliminated. Ohno cautions that there is no final amount of *kaizen*, that the "ideas are infinite."

Table 1.1: Seven wastes of lean manufacturing [Lean Manufacturing Tools 1]

Transportation	Movement of materials or work from one place to another
Inventory	Raw material, works in progress, or final products that are stored while not in use
Motion	Unnecessary or excessive movement of people or machines
Waiting	Any idle time between operations, whether for operators or materials
Overproduction	Making too much or too early
Over-processing	Using inappropriate equipment or processes
Defects	Any work or material that is not usable for the end product

Ohno uses another system to eliminate waste, his 4 S's (now thought of as the 5S system). These include sort, set in order, sweep, standardize, and sustain [Table 1.2]. Though these translations from Japanese are not exact, they describe the general sense of order that is required for manufacturing processes to operate smoothly. For example, the traditional sense of "set in order" simply means to put things in neat lines. However, Ohno's principles go beyond the conventional understanding of the action to the reason behind it. Ohno uses set in order as a guideline for "arrang[ing] things so that they can be immediately retrieved." Ohno states there is "no S for 'lining things up'" [Ohno 112].

Table 1.2: 5S of lean manufacturing

Sort	Distinguishing between necessary and unnecessary things, and getting rid of what is not needed
Set in Order	Orderly storage so the right item can be picked at the right time. A place for everything and everything in its place.
Sweep	Create a clean worksite without garbage and dirt so problems can be easily identified
Standardize	Setting up standards for a neat, clean workplace
Sustain	Implementing behaviors and habits to maintain the established standards over time

These principles are the foundation for the TPS method, but they must be implemented well to actually reduce cost and waste. One of the problems Ohno continually faced was how "misconceptions easily turn into common sense" [Ohno 17]. To curtail this, he advocated for a *go-and-see* model. When managers or engineers insisted on making changes, he would have them go to the location and look for what was causing the problem. In addition, they needed to try doing the task themselves to truly understand the issues at hand. Even after the changes were made, Ohno instructed the engineers to "go see with your own eyes, and you will understand very well what things were tried and what things were not included in your calculations" [Ohno 14].

C. Methodology

After learning and practicing some of the TPS principles at various factories in Mississippi, I decided that applying the same principles to the prep process and basecamp organization could produce significant benefits for HIOBS. Since I did not have any experience at the time with leading courses, I chose to assume that the final product was already acceptable and focused my changes primarily on the preparation process. I discussed the idea with the Program Manager, Julia Makowski, who runs Wheeler Bay.

I began in May 2017 by spending a week documenting the initial conditions. I took pictures of the various rooms, gear storage systems, and lists that we used. I drew layouts of these same rooms and followed a team of instructors through prep, noting where they were spending their time and what their concerns were during the process. After that, I prepped for my first course as an assistant instructor. I kept notes of time spent on each task and retained the checklists we used.

This course was followed by a three-week period of incremental changes. By consulting with Julia and other seasoned instructors, I was able to integrate the principles of TPS into our process without affecting the quality of the boat configuration. I documented the iterations, as well as how staff responded to the changes. Since I was performing this study during the working season, it was critical to plan out changes before starting implementation and work quickly. I also spent time working with the Head Logistics Coordinator, Jilli Miller, on training and documentation. Since HIOBS is seasonal work and there is regular turnover, there is a high likelihood that changes made will be forgotten quickly. At the end of this three-week period, I prepared for my second course of the summer. This was a chance for me to evaluate the changes from the user's perspective, and I documented the process as well.

At the end of the season, I created a survey to gather data from the other instructors on the impact of the changes. The results of this survey will be discussed in Chapter 4, along with an analysis of the updated layout and process. Since it was somewhat impractical to do 2-day time studies, more emphasis is placed on these responses as to the success of this study.

CHAPTER 2: INITIAL CONDITIONS

The prep process precedes every course that leaves Wheeler Bay. At least four people are involved for two or three days each. The course director (CD) and logistics coordinator (LC) begin with prep-for-prep, a full day of work where they ready things for the instructors. Once instructors arrive, they meet the CD and LC to start the prep process with a small mountain of checklists and forms. The CD guides them and the LC supports with various tasks, but the instructors do the bulk of the work. This all happens on base, so people are moving around completing all necessary tasks to prepare for the students' arrival. The information in this chapter reflects the conditions before any changes.

A. Layout

It is helpful to understand the base's layout when discussing the process. Wheeler Bay is in Spruce Head, Maine, where all summer sailing courses are started. The property, formerly a granite mining operation, extends about a half mile from Seal Harbor Road. There are a number of buildings on base, but the majority of those used during prep, course start, and course end are located close to the end of the pier [Figure 2.1]. Of particular importance are the pier building, the lockers, and the dock where the boats are kept.

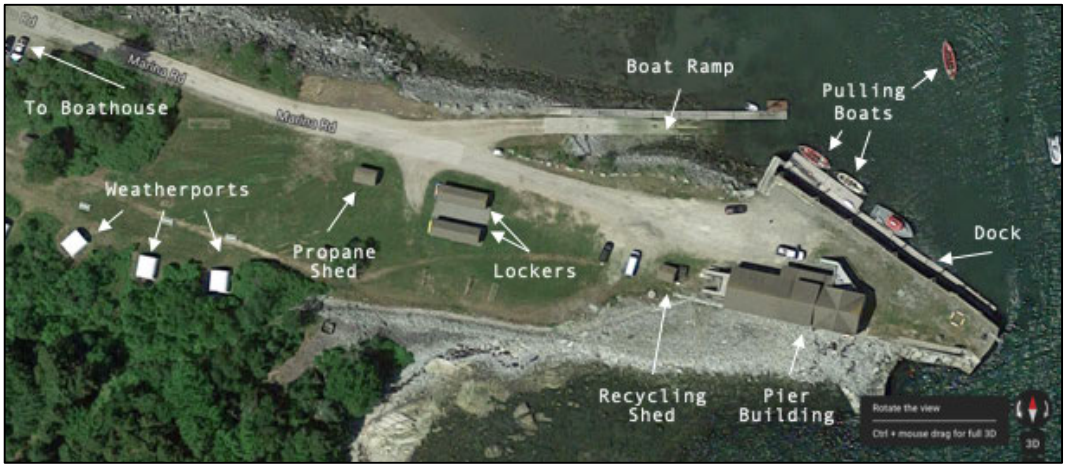


Figure 2.1: Layout of HIOBS Wheeler Bay base [Google Maps 1]

Inside the pier building are both administrative and logistical spaces. The ground level contains offices for CDs, a logistics office, a supply room, a school store, bathrooms, a medical supplies room, a laundry room, a pantry, and a kitchen referred to as the pack-out room [Figure 2.2]. Upstairs are offices for the program manager and CDs, an administrative area with office supplies, a meeting room, a bathroom, and a student gear room [Figure 2.3].

On the ground level, the supply room houses a large assortment of gear used for expeditions as well as gear repair and base maintenance [Figure 2.4]. The supplies are grouped by function. Areas such as navigation, charts, library, and consumables have lists posted of the items needed for each expedition that are to be packed in the corresponding container. Each area in the supply room has 3 shelves. The top shelf and the floor are mostly used for long-term storage and excess inventory, while the middle two shelves house the items that are in current circulation. The shelves have labels indicating where many items go, but some have fallen off and others no longer describe what is located there.

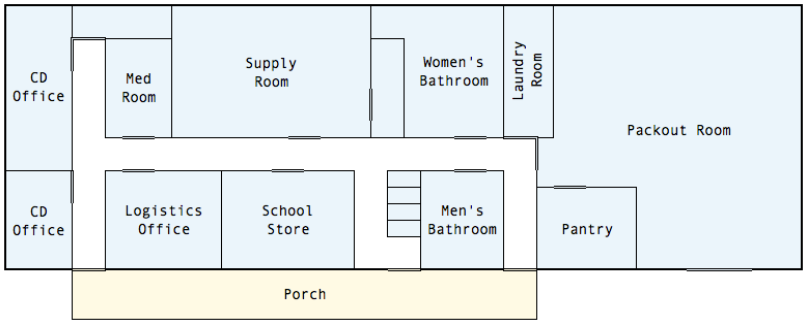


Figure 2.2: First floor layout of pier building

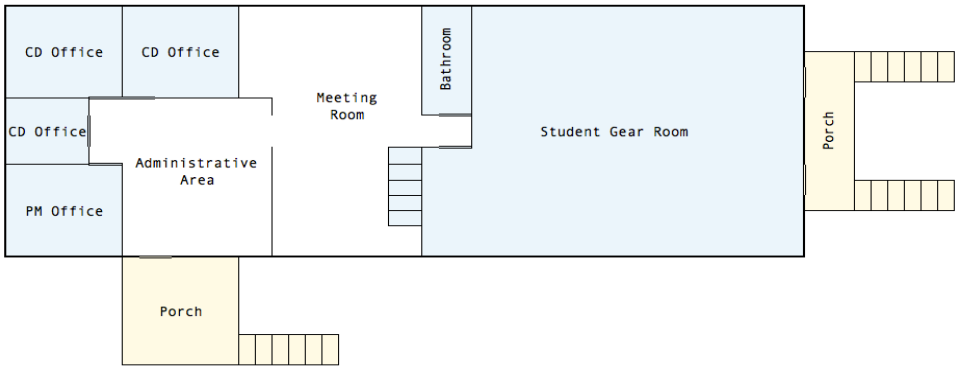


Figure 2.3: Second floor layout of pier building

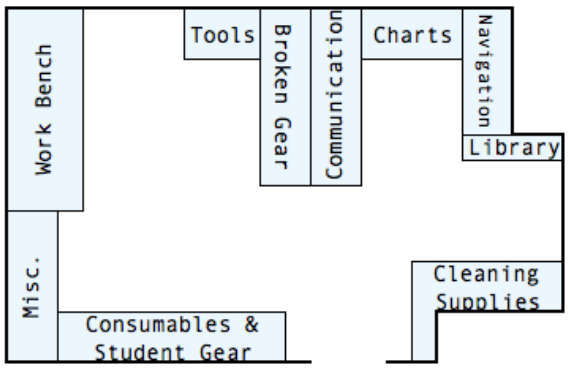


Figure 2.4: Layout of supply room

The pack-out room is also downstairs [Figure 2.5]. In addition to storing the food used on expeditions, it is a functioning kitchen where all meals on base are cooked. There is a pantry connected to the pack-out room that houses items such as canned beans, pasta,

and peanut butter delivered by Sysco and other suppliers. Bread products are stored in a large chest freezer, and produce and dairy are in the left side of the walk-in fridge. Dry goods like rice or pretzels are stored in twenty-gallon containers near the two tables where all of the food prep is done. Pots, pans, scoops, and knives are located under these tables. After each pack-out is completed, it is stored in large fish crates that are placed in either the walk-in fridge or on the shelves by the double doors.

The student gear room is located upstairs [Figure 2.6]. It is essentially an attic with storage for most of the clothing that is loaned to students for each trip, including foul weather gear, personal flotation devices (PFDs), rubber sea boots, sleeping bags and pads, and assorted warm clothes. The student gear is organized by size. In addition, it houses the dive gear that staff use for various drills and swimming exercises. In the eaves, there are piles of retired gear, new PFDs and boots, assorted tent parts, and crates of gear from the Florida base. All of the dirty sleeping bags are placed in the laundry bin near the outside door for dry cleaning.

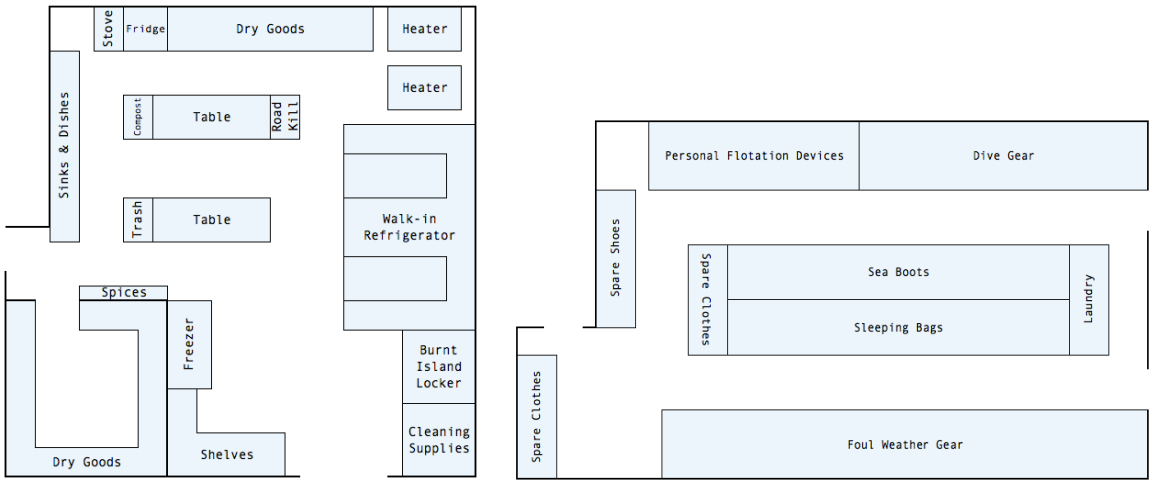
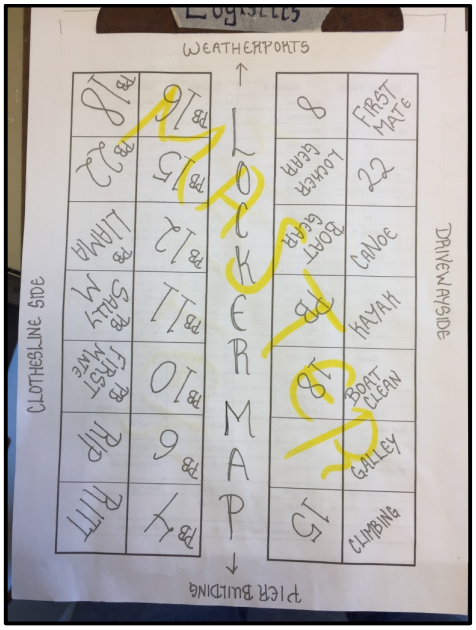


Figure 2.5 and 2.6: Layouts of pack-out room and student gear room

The lockers lay 50 yards to the west of the pier building. Numbering 28 in total, they are each 5’ by 5’ with two shelves. There is only one copy of the master locker list, with the lock combinations and possible contents on the back side [Figure 2.7]. The contents vary from locker to locker. Some lockers (i.e. PB 22, Llama, First Mate, Sally M, PB 4, PB 6) are often dedicated to one boat’s gear for the entire summer while the rest are used as surplus storage. The lockers have labels on their doors, but the labels don’t describe what is inside the locker and there are four sets of duplicates. An inventory performed on May 22, 2017 revealed that many of the lockers were partially stocked, or their contents were not related by any theme [Figure 2.8]. Next to the lockers are three drying lines that are used during gear clean.



PB 18	
Type 1 PFDs	13
Anchors & rode	2
Lines	3
Tool kit	1
Galley (full)	1
Life ring	1
Bilge pumps	2

PB 16	
Type 1 PFDs	13
Life ring	1
Bilge pumps	2
Danny & rode	1
Dock lines	3
Lead line	1
Darlocks	8

PB 8	
Old main tarps	40
Old stern tarps	5
Tarp bags	20

First Mate	
Basecamp stoves	13

PB 22
Full inventory

PB 15	
Type 1 PFDs	13
Bread box	1
Stove & box	1
Life ring	1
Bilge pump	1
Lead line	1

Locker Gear	
2.5 gal jugs	22
5 gal jugs	13
20 L jugs	1
Assorted caps	30

PB 22	
Canoe paddles	2
Throw bag	1
Buckets	3

Llama	
Duffels	9
Sleeping pads	12
Galley (full)	1
Head box (full)	1
Buckets	7
5 gal jugs	5
Stove box	1

PB 12
<Empty>

Boat Gear	
Candle lanterns	11
Old stove boxes	6
Yellow buckets	2
Old head boxes	2
Fender	1

Canoe	
Machias quads	99
Crock pot	1
Coffee pots	6
Pots	3
Pans	2

Sally M	
Type 1 PFDs	13

PB 11	
Stock & rode	1
Sails	2
Type 1 PFDs	13
Galley (full)	1
Fender	1
Tool kit	1
Monkey lines	5

PB	
Old galley boxe	11

Kayak	
Basecamp stoves	2
Galleys (full)	2

First Mate	
<On expedition>	
Fender	2
Dock lines	3
Monkey lines	8

PB 10	
Type 1 PFDs	13
Sails	2
Bailer	1
Anchors & rode	2
Life ring	1
Towlines	2
Tool kit	1

PB 18	
Hiking packs	7
Bad tent sets	11
Bad tent flys	4

Boat Clean	
Large tubs	7
Sponges	20
Brushes	20
Scoops	20
Bailers	10
Helmets	10
Bilge pumps	3

Rip Hudner	
Sharpie gear	
Not inventoried	

PB 6
Full inventory

<Blank>	
Sleeping pads	50
Duffel bags	20
Duffel straps	40
Old duffel bags	80

Galley	
Galley boxes	3
Mesh bags	15
Pots	12
Coffee pots	3
Ladles	30
Skillets	2
Utensils	20

Ritt	
Sharpie gear	
Not inventoried	

PB 4
Full inventory

PB 15	
Bread box	3
White buckets	30
Red buckets	10
Green buckets	3
Yellow buckets	4
Gamma lids	30
Snap lids	80

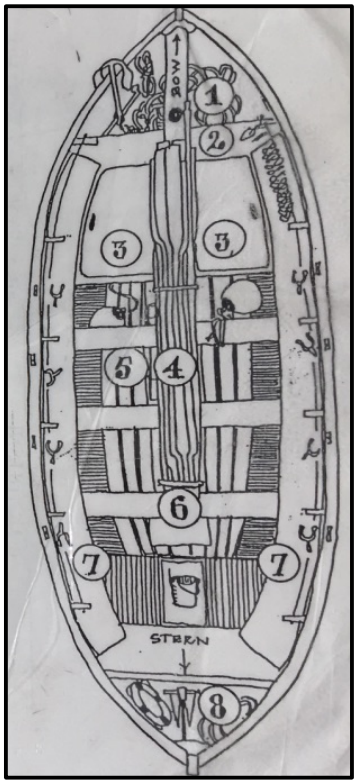
Climbing
<Locked>

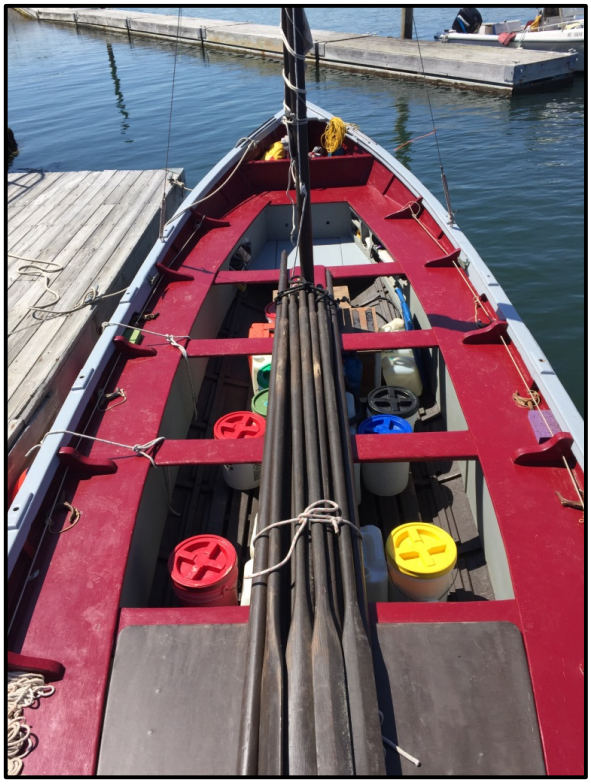
Figures 2.7 and 2.8: Master locker list and inventory check of all lockers (5/22/17)

The pulling boats that are tied to the dock are the final destination for all of the expedition gear. HIOBS’s oldest boats in use date to 1968 and the design has been

relatively unchanged, with only minor dimensional adjustments to storage compartments. They are 30’ long, 8’ wide amidships, and they draw 18” of draft with the rudder and centerboard up. Essentially lifeboats with sails, they can be completely capsized without sinking. They are rated for two instructors and eleven crew, so it can be quite close quarters aboard. There are two masts – the main (located forward, just behind the bow well) and the mizzen (located just forward of the cockpit).

The on-board storage system accounts for sailing and navigation gear as well as all gear needed for living aboard, such as cooking, sleeping, and proper hygiene. The vessels are highly compartmentalized to accommodate this variety [Figure 2.9]. Instructor gear is stored in the stern well (3 in Figure 2.9). The stove, navigation gear, and canned food is stored in the cockpit (7). The propane, galley supplies, dry food (stored in five-gallon buckets), student gear (in 65-liter duffel bags), water, and communications gear is all stored amidships, below the seats (5). The oars are lashed to the deck (4). In the two forward hatches, the toolkit, type I PFDs, sleeping pads, tarps, and produce are all stored (3). Lastly, the anchors and head box are kept in the bow well (1). Stocked in such a fashion, the entire deck can be used by students for seating, maneuvering the sails or oars, and sleeping at night [Figure 2.10].





Figures 2.9 and 2.10: Diagram of boat storage and a partially stowed pulling boat

B. Process

The prep process has been structured over the years into a series of checklists, supplemented by topical conversations and personal experience, that represent what instructors consider best practice. These checklists are somewhat piecemeal, in that they were created in separate occasions and there is no standard system or review that makes sure they all work together. Many items appear on multiple lists. These lists cover areas such as talking points (how instructors will work together, student management, expedition planning), paperwork, on-course support, food pack-out, boat inventory, gear inventory, and other logistics. Though these lists include all of the necessary steps, they are

implemented in varying order based on instructor preferences. The following will be a generic version of the process [Figure 2.11].

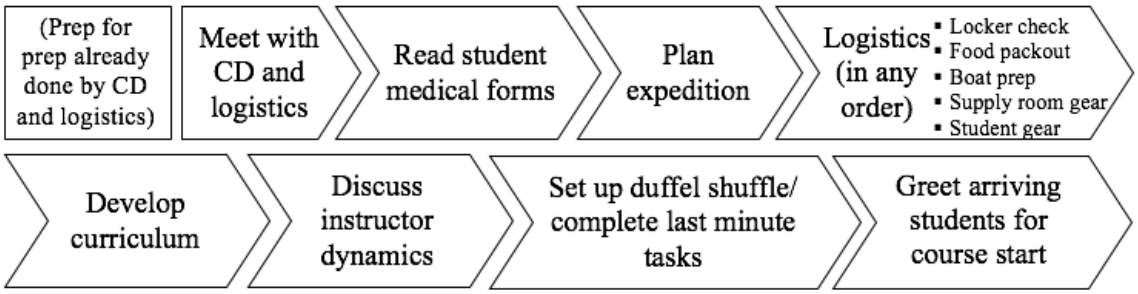


Figure 2.11: Flow chart of typical prep activities for instructors

The first step is prep-for-prep, which is performed before the instructors arrive on base. The CD uses the CD course support checklist to prepare themselves and set up the process for the instructors [Figure A.1, in the appendix]. This mostly involves printing off all of the instructor paperwork and making sure there are no red flags in the students' information. The LC uses the logistics support checklist to make sure all of the gear is in place for the instructors [Figure A.2]. They check the locker's contents and place the communication gear, navigation gear, med kit, and student gear (whistles, mugs, handbooks, and bowls) in the hallway outside of the supply room. Each of these gear sets has its own inventory checklist that is posted by the corresponding gear. The LC also records which camera and cell phone are assigned to the course. Often there is more than one course prepping at the same time, so each pile of gear is labelled by the name of the boat.

When the instructors show up the next day, that is the official start of prep. They are guided by their CD and the instructor prep checklist [Figure A.3]. This is supplemented

by a logistics pre-course request form [Figure A.4] and a menu selection form [Figure A.5] from the LC. Since the instructors have often never worked a course together, they meet with the CD to discuss how prep will flow as well as any special concerns about base, the boat, or the students. The prep request form and menu need to be returned by a certain time so that the LC can sufficiently prepare for all of the requests.

The instructor prep checklist can basically be broken down into three parts: paperwork, conversations, and logistics. The conversation points cover a broad range, including co-instructor consistencies, instructor and course goals, policies, expedition planning, teaching topics, service and challenge elements, and course development. They are not a variable in this survey, but they arguably affect the course quality the most because they are more subjective than the other parts. It is the goal of this study to minimize the time spent on logistics to maximize the time that instructors have to tackle these topics.

The accompanying paperwork is mostly formalization of the conversations (i.e. expedition plan, menu), so they are often completed in conjunction. The student medical forms are especially important paperwork to review. They contain any behavioral or medical concerns, students' reasons to take the course, and admissions' evaluation of the student.

The logistics of prep include five areas: food prep, locker check, boat check, navigation and communication gear, and student gear. The food pack-out is done in the pack-out room with a checklist that the LC has created from the menu spreadsheet [Figure A.6]. Each person involved picks a category and packs the specified amount of each item. The food is placed in fish crates, and the produce and dairy are left in the right side of the

walk-in fridge. The dry goods are left on the shelves near the double doors. There are often out-of-stock items that the LC will pick up at Walmart and supply before course start.

The locker is stored according to the locker inventory checklist [Figure A.8]. It includes student gear, storage containers for food, water, and cooking, and the cooking and sanitary gear. Most of this gear is either moved to the boat or the pack-out room, with the student duffels and sleeping pads staying in the locker until the start of course. If there is something missing, the instructors talk to the LC to look for a replacement, which often involves opening many lockers. There are two small carts that are used to transport this gear from the locker. Items such as the library bucket (a small collection of books on sailing) and consumables bucket (miscellaneous supplies like batteries and toilet paper) have their own content lists, with the inventory located in the supply room.

The boat check involves using the pulling boat inventory checklist to thoroughly review the contents of the boat [Figure A.9]. Even though the previous instructors were supposed to have checked for completeness, it is ultimately the current instructors' responsibility to make sure that everything is in place and in satisfactory condition before the expedition. The instructors will check to make sure safety equipment is operational and stow items brought from the locker. Depending on when the boat was last used, there may be additional items to get from the boathouse such as rigging or extra lines.

For the navigational gear, there is the navigation box checklist [Figure A.10]. This includes the compass, Coast Guard required literature, pencils, and various lists that are useful for on-course identification. This is all packaged in a small fish tote used as the nav box. There is also a set of charts. The nav box and chart set have been prepared by the LC and placed in the hallway, but the instructors double-check the contents and stow them on

the boat. The communication gear is also re-inventoried, and the instructors test the cell phone, camera, and both VHF radios (one handheld and one ship-to-shore).

The final step for prep is the student gear. This is often saved until the day of course start, as students arrive in the afternoon. The medical kit is rechecked, and it is taken along with the bowls, student handbooks, whistles, and mugs to the field near the lockers. The students' sleeping bags, sleeping pads, and duffels are also taken to the field and arranged in a circle, called the "duffel shuffle." During course start, each student's gear is screened and any additional clothing or supplies is gathered from the student gear room or supply room and noted so they can return it at course end. The students also visit the student gear room to select their boots, PFDs, and foul weather gear. The crew usually spends one night on base before casting off the next morning. Their luggage is stored safely in the lockers while they are on expedition.

C. Summary of Initial Conditions

These descriptions reflect the conditions found on base at the beginning of the 2017 summer season. Expedition gear is spread between many rooms in the pier building, as well as the lockers and boats. The pulling boats themselves also have a specific layout once the equipment is completely loaded. The prep process for loading the boats varies by instructor, but this section contains all of the essential logistics activities. To keep track of these critical components, there are numerous checklists to guide instructors. However, they are not seamless and cohesive, the result of many generations of lists being used simultaneously.

CHAPTER 3: MANUFACTURING CHANGES

After surveying the initial conditions of the prep process and completing my first course, I spent three weeks implementing changes based on the manufacturing principles mentioned in Chapter 1. By working with Julia Makowski, Jilli Miller, and other staff, I was able to plan and discuss each change before implementation. The changes were made in pieces, and only the final revisions will be presented here. The changes were documented and communicated to LCs and instructors as were made.

These principles could potentially be applied to many operational areas of HIOBS, such as course structure, resupply operations, course prep, or gear clean. Due to my previous experience working in logistics and the limited time available, I chose to focus on the logistics portion of the prep process. This includes the activities of logisticians and the course director, but primarily covers what instructors do to prepare the boat and gear for students. The instructor prep checklist [Figure A.10] comprehensively lists the essential prep activities, so I used it as my guide. I sought to align the process and layout into a more cohesive system, looking at each in terms of how it interacts with the other. Practically, this involved making changes that eliminated waste and confusion.

The changes made affect only the prep process, so the final pack-out of the boat remained unchanged. Likewise, I left the checklist section on instructor paperwork and planning unaltered. Some possible improvements that were discussed involved adding or changing the infrastructure on base, but these were avoided both for reasons of time constraints and limiting the disruptive nature of this study. The following sections are

arranged as they appear on the updated instructor prep checklist. The manufacturing principles, described in Chapter 2, are listed in brackets after alterations that utilized them.

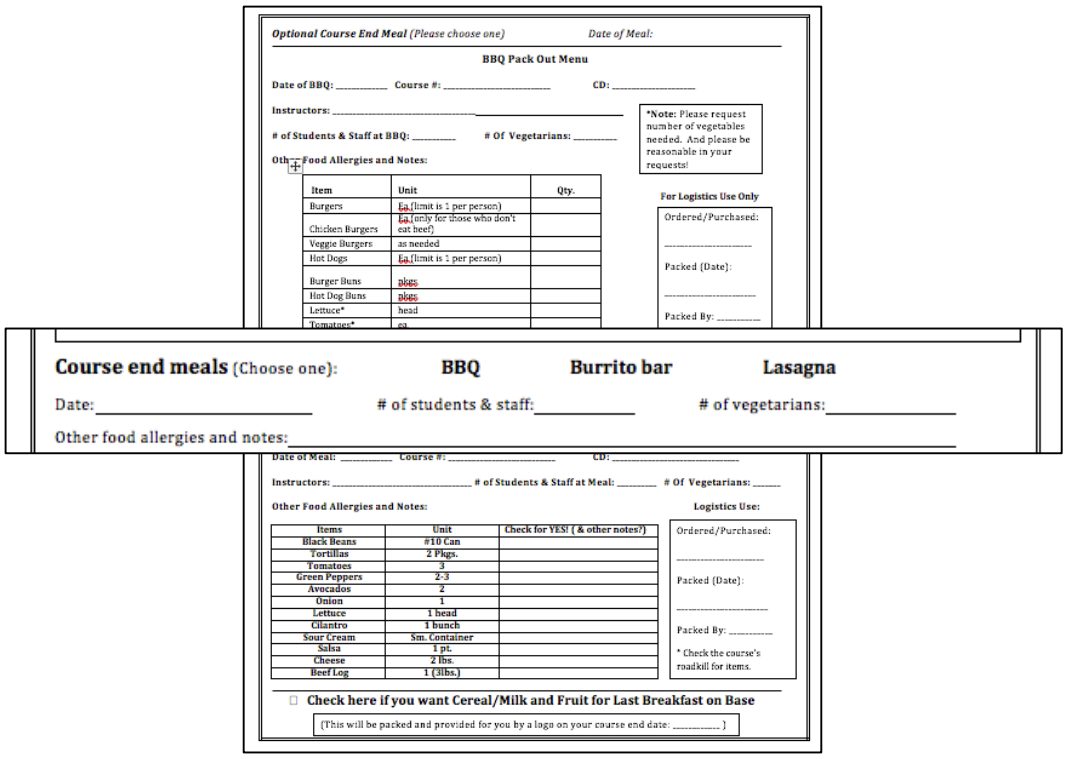
A. Food Pack-out

First on the checklist, food pack-out is the area most similar to traditional manufacturing operations, since it has various "parts" inventories that are packaged for the customer and then consumed. Logistics staff often request that it is done earlier, so they have time to fit in a run to Walmart for missing items and fresh produce. The old process started with instructors filling out multiple menus, then logistics would use an excel program to turn those into an ingredients pack-out list. The entire prep team would then put all of these items into their appropriate containers and pile them in a fish crate, waiting until the day of course start to transfer them into buckets.

The pack-out process and layout received only minor changes. On the instructor checklist, all of the menu action items were grouped in this section so all food considerations could be made at one time [set in order]. One of these choices, the course end meal, was simplified from selecting individual ingredients to simply picking one of the options [sort] [Figure 3.1]. This was the only time that we required instructors to make detailed food choices, which were unnecessary.

The buckets were also moved into the pack-out room from the lockers [transportation] [just-in-time] [Figure 3.2]. While the buckets had been counted out so each boat had enough in its locker, they were not differentiated and could be used on any boat. Moving them to the pack-out room eliminated their transport to and from the lockers and made it easier for instructors to use only as many as they needed. There had also been

frequent occasions when a locker had too few buckets, and instructors spent time opening other lockers looking for more.



Optional Course End Meal *(Please choose one)* *Date of Meal:*

BBQ Pack Out Menu

Date of BBQ: _____ **Course #:** _____ **CD:** _____

Instructors: _____

# of Students & Staff at BBQ: _____ **# Of Vegetarians:** _____

Oth Food Allergies and Notes:

***Note:** Please request number of vegetables needed. And please be reasonable in your requests!

Item	Unit	Qty.
Burgers	Ea.(limit is 1 per person)	
Chicken Burgers	Ea.(only for those who don't eat beef)	
Veggie Burgers	as needed	
Hot Dogs	Ea.(limit is 1 per person)	
Burger Buns	pkgs	
Hot Dog Buns	pkgs	
Lettuce*	head	
Tomatoes*	ea	

For Logistics Use Only

Ordered/Purchased: _____

Packed (Date): _____

Packed By: _____

Course end meals (Choose one): **BBQ** **Burrito bar** **Lasagna**

Date: _____ # of students & staff: _____ # of vegetarians: _____

Other food allergies and notes: _____

Date of Meal: _____ **Course #:** _____ **CD:** _____

Instructors: _____ **# of Students & Staff at Meal:** _____ **# Of Vegetarians:** _____

Other Food Allergies and Notes:

Logistics Use:

Items	Unit	Check for YES! (& other notes?)
Black Beans	#10 Can	
Tortillas	2 Pkgs.	
Tomatoes	3	
Green Peppers	2-3	
Avocados	2	
Onion	1	
Lettuce	1 head	
Cilantro	1 bunch	
Sour Cream	Sm. Container	
Salsa	1 pt.	
Cheese	2 lbs.	
Beef Log	1 (3lbs.)	

Ordered/Purchased: _____

Packed (Date): _____

Packed By: _____

* Check the course's roadkill for items.

☐ **Check here if you want Cereal/Milk and Fruit for Last Breakfast on Base**

{This will be packed and provided for you by a logo on your course end date: _____ }

Figure 3.1: Simplification of course end meal selection

Figure 3.2: Buckets relocated to pack-out room

B. Boat prep

This section, which replaces "Bosun's Locker," includes examining all of the gear stored on the boat as well as a number of outside activities. Each boat has its own peculiarities and instructors take care to know it thoroughly, since it will be serving as vessel, shelter, kitchen, and possibly life raft. In the old process, instructors would check the inventory of their locker, cart most of that down to the boat, load the boat, and then go through the boat inventory checklist. This also involved gathering a number of supplies from other buildings, such as consumables, the library, and fuel.

The largest change involved eliminating the locker check and moving its contents to more convenient storage locations [transportation] [over processing]. Items like the galley box, water jugs, and bilge pump are durable enough to be left on the boat between courses. The nav box is left on the boat as well, which contains the ship's log (a legal document that is required to stay with a particular vessel) and the boat inventory checklist. This checklist was updated to include the new items and eliminate listings of gear that appears on other lists [over processing] [Figure A.11]. All of the outdoor activities are now listed in this section, including getting propane, filling water jugs, and checking the stove function [set in order]. These are now listed as actions rather than items for clarification – "get propane from logistics" rather than "fuel." Retrieving the tarp from the locker is also listed here.

The VHF radio and stove left on the boat are not completely safe, since they must stay out of prolonged saltwater exposure. Since these boats are wooden, they absorb water and must be pumped out occasionally. Fortunately, the cockpit floor is elevated so the radio and stove are stored there. Otherwise, all of the gear left on the boat is either of extremely

rugged construction or placed in a watertight enclosure. While this works for most of the locker's items, the tarps would mildew on the boat. They are still stored in the lockers because they do not fit in any of the categories of the supply room or student gear attic. This will be addressed in the recommendations section.

C. Supplies

A number of gear sets are located in the supply room such as consumables, the library, communication gear, and navigation gear. All of this gear needs to be stored dry, so the supply room provides that environment in addition to ease of access for logisticians and instructors alike. This space has functioned as a "catch-all," since it encompasses not only the above categories but also cleaning supplies, a repair station, and miscellaneous supplies from years past. Last summer I attempted to clearly define the categories of gear stored here, and that reduced the volume and potential for re-crowding [sort]. In the old system, a logistician would prepare the comms box, med kit, and certain student gear in a pile in the hallway outside the supply room. Instructors would bring in buckets from the locker to fill them with the correct inventory and take all of this to the boat.

Since the previous reorganization had left space on the floor under all of the shelves, I moved containers from the lockers to the supply room under their respective gear [transportation]. This highlighted one of the mantras I used to guide this study: "put containers with their contents." While the final location of a gear set needs more direction than that, acting on this simple phrase eliminated a fair amount of transportation. I also updated the inventories associated with each container to the current best practice [defects]. These were posted above the area where their contents were stored, and the contents were

rearranged so that they were in the order of the listing [set in order] [Figure 3.3]. Now instructors will know where to look for supplies, because items are located in the same groupings as on the boat.

While the comms boxes were already stored in the supply room, I moved the comms equipment in here from the logistics office [set in order]. Since most of the comms need to be charged (radio, beam gun, camera), the logisticians could oversee that in the charging station set up in their office. I added a power strip with multiple USB adapters to accommodate the various cords and create a designated charging area [standardize] [Figure 3.4]. These inventories were listed in various sections of the instructor prep checklist, so I grouped them together under the Supply Room title [set in order].

Figures 3.3 and 3.4: Supply room organization and comms charging station

The supply room still contains cleaning supplies, broken gear, and the repair station. There is a large probability that it will resume its role as random storage without more clarification and standardization. Also, the med kits and comms prepared by the logisticians are still set in the hallway, since they have no designated home [Figure 3.5].

While logisticians had been in charge of all comms prep or changes, this responsibility is a bit more nebulous since instructors now have direct access to the charging station and cables.

Figure 3.5: Supplies stored in hallway

D. Student gear

There are a number of items (whistles, mugs, sleeping bags, duffels) that are gathered to issue individually to students. Some of these are size-specific and require that the students try it out to be sure of fit, while others can be blanket issued. All of these items need to be stored dry, so they have been stored in the supply room, student gear room, or lockers. Previously, instructors added liners and sleeping equipment from the attic to duffels in the lockers, and the duffels were arranged in a field for "duffel shuffle" when the students arrived. Other items were picked out by students during their visit to the attic, or instructors retrieved them from the supply room.

As part of the locker evacuation, the sleeping pads, duffels, and duffel liners were brought upstairs and stored in bulk[inventory] [set in order] [Figure 3.6]. This reduces the need to have specific quantities in each locker. The whistles, mugs, and spare headlamps

and toiletries from the supply room and bowls from the pantry were also moved to the student gear attic [set in order] [Figure 3.7]. There is a checkout form where students mark any gear they borrow (to be accounted for at course end), and this was updated to include sizes of boots, PFD, and foul weather gear. By tracking what inventory we actually use, we will be able to order only the necessary gear [sort]. Whistles, bowls, and mugs are no longer left by the logisticians in the hallway during prep for prep. Instructors gather mugs and bowls, and students attach their whistle to their PFD when they find their size [sort].

Figures 3.6 and 3.7: Duffels and other student gear moved to the student gear room

While these changes help clarify where student gear is to be found, they do not eliminate or lessen the transportation needed to get the duffels down to the field. Likewise, the drying lines for foul weather gear and PFDs is in this field, a fair walk from their storage space. Another concern is whether students will remember to write down their sizes on the checkout form while there is so much else going on at the beginning of the course.

E. Lockers

Since the lockers are set apart from the main activity of the pier building, they seem to have avoided much systematic scrutiny. As a result there are remnants of different systems, and looking for an item like a boat hook or coffee pot is like playing a tile-matching game. They are also the farthest storage from the boats (save the boathouse up the road), but they have the most space. Previously, logisticians checked the locker, instructors checked the locker, carted items to the pier building or the boat, and then stored students' luggage here during course. If they were short an item, they would open other lockers until they found what they needed.

As was previously mentioned, the locker check was eliminated by storing the contents on the boat, in the supply room, or in the student gear attic [set in order] [transportation]. The locker is still used to keep student luggage safe, but otherwise it is only full of gear during the off-season. Julia Makowski plans to have a maximum of 12 active boats during a season, so one bank of lockers was set aside for active boats while the other is designated for inventory. The inventory lockers are organized so they spatially correspond to where items are found on the boat inventory checklist [set in order] [Figure 3.8]. Any old documentation that was found in the lockers was removed, as this could be confused for the standard operating procedure [sort]. An updated map of the lockers was created and submitted to Jilli Miller [Figure 3.9].

Even though the contents of the lockers are now organized, the labelling is still misleading. There are a number of repeated labels, and almost none of those on the inventory lockers are correct. It is crucial that labels be accurate, durable, yet also easily

corrected. There is also a large amount of older gear that serves no current purpose. The lockers facilitate the attitude of "out of sight, out of mind" that leads to quick accumulation.

PB 18	PB 16
Gear for PB 18	Gear for PB 16
PB 22	PB 15
Gear for PB 22	Gear for PB 15
Llama	PB 12
Gear for Llama	Gear for PB 12
Sally M	PB 11
Gear for Sally M	Gear for PB 11
First Mate	PB 10
Gear for 1st Mat	Gear for PB 10
Rip Hudner	PB 6
Sharple gear	Gear for PB 6
Ritt	PB 4
Sharple gear	Gear for PB 4

Lines/Anchor	Base Stoves
Stock anchors Danforth anchors Dock lines Monkey lines Tow lines	Base stoves Charcoal
Boat Gear	Florida
Bilge pumps Tool kits Lights Fog horns Boat hooks Fenders	Gear for Florida
Stoves	Florida
Stove boxes Stoves Stove hoses	Gear for Florida
Galley	Florida
Galley boxes Pots & pans Mesh bags Coffee pots Utensils Knives	Gear for Florida
Tarps	Land Gear
Main tarps Stern tarps Candle lanterns	Hiking packs Tents Tent parts
Head Gear	Boat Clean
Head boxes Head buckets Head lids Head seats TP holders Soap bottles	Buckets Bilge pumps Sponges Brushes
Water Jugs	Climbing
5 gal jugs 2.5 gal jugs Lids & caps	Climbing Gear

Figures 3.8 and 3.9: Updated galley inventory locker and locker list

F. Summary of Changes

These changes represent the core of this study, combining manufacturing principles like 5S and elimination of the 7 wastes with the prep process at Wheeler Bay. Almost all of the logistical areas were examined and altered in some way, both in the process documentation and physical configuration. The most consequential change was the elimination of the locker check, as that brought forth changes in every other space. It also contributed to the new form of the instructor prep checklist, which proves to be the most important document during the whole process, pointing to all essential prep activities. In the next section, I will examine whether these changes created any noticeable differences, both positive and negative.

CHAPTER 4: EVALUATION OF RESULTS

In order to determine the effects of the thesis statement at the heart of this study, evaluation criteria and methods of collecting relevant data must be established. The thesis asks if the changes "reduce the time instructors spend on logistics and increase standardization," so these were naturally the two categories used for evaluating the effectiveness of the changes. I spent time gathering data both during and after the study so that a thorough analysis could be performed. In addition to these areas where I was searching for verification of academic theories, I also discovered some interesting cultural phenomena related to HIOBS and manufacturing.

The most effective tool for evaluating process time is a time study, where every step of the process is timed and recorded in order. This helps track what steps take more time, and if improvements are made, these studies can detail exactly where and how much time was saved. Repeated over multiple trials, these can also reveal how standardized a system is by looking for variations in time per step or process order. However, time studies were judged impractical for this project. Since the prep logistics process takes approximately 8 hours with up to 4 people working at a time, performing multiple studies before and after the changes would have taken a significant amount of the time available for actual changes. Furthermore, instructors mentioned that they would feel uncomfortable and rushed if they or someone else were actively recording them.

In lieu of a time study, I opted to gather firsthand accounts, copies of documents, photos, and distribute an end-of-season survey to instructors. These measures provided the

necessary data to form a clear picture of where the changes succeeded and where they fell short. Conversations with instructors, Julia Makowski, and Jilli Miller gave better insight into the sustained impacts, since I left soon after the changes were made. The 10-question survey asked for information about their level of experience with prepping courses, how they spent their time before and after the changes, and whether the changes affected the quality of prep and their course [Figures A.13, A.14, A.15]. The questions are shown in Table 4.1.

Table 4.1: Survey Questions

1	What's your name?
2	How many years have you worked as a sailing instructor at HIOBS?
3	How many courses did you instruct during the 2017 summer season?
4	Before these changes, how long did the logistics of prep take?
5	Before these changes, how many times did you visit the following during prep?
6	After these changes, how long did the logistics of prep take?
7	After these changes, how many times did you visit the following during prep?
8	Compared to previous conditions, did you find the boat and all gear stored in an acceptable state?
9	Did you feel like these changes increased or reduced your stress during prep?
10	Do you have any comments on these changes or suggestions for improvements to the prep process?

A. Time Reduction

The priority of this project was reducing the amount of time that instructors spent on the logistics of the prep process. I relied on the survey to reveal general trends, with personal experience providing a more exact viewpoint. Survey questions 4 and 6 were the most relevant. Since it could be difficult to report with accuracy how much time was spent on each step, the options were ranges (<1 hour, 1-2 hours, 2-3 hours, 3+ hours). This led

to some difficulty quantifying improvements, so every answer was translated to the midpoint of the range (0.5 hours, 1.5 hours, 2.5 hours, 3.5 hours) for comparison purposes. I had thirteen responses out of 39, or a 33% response rate [Table A.1]. While this is not enough to perform serious statistical analyses, there were a number of results that could be extrapolated.

By comparing the averages from questions 4 and 6, it is clear that there was an overall reduction in logistics prep time [Table 4.2] Total time before the changes was reportedly 6.2 hours, and it was reduced to 4.6 hours (25% decrease). Activities related to the locker accounted for the largest percentage of the change (44%), followed by boat prep (26%), pack-out (18%), and student gear (12%). Every category reported an average decrease of 0.2 hours or greater, so the changes proved successful to some measure in all areas. Even on the individual level, 10 of the 13 instructors marked an overall reduction in prep time, with one showing no effect and one marking an increase in time spent (one instructor listed no initial times).

Table 4.2: Averaged survey responses for questions 4 and 6

Instructor	Time BEFORE CHANGES [<1, 1-2, 2-3]					Time AFTER CHANGES [<1, 1-2, 2-3]				
	Boat Prep	Locker Check	Food Pack-out	Student Gear	Total	Boat Prep	Locker Check	Food Pack-out	Student Gear	Total
1	1.5	1.5	2.5	1.5	7	0.5	0.5	1.5	0.5	3
2	1.5	1.5	1.5	0.5	5	1.5	0.5	1.5	0.5	4
3	1.5	0.5	2.5	0.5	5	1.5	0.5	1.5	0.5	4
4	No response					1.5	0.5	0.5	1.5	4
5	1.5	1.5	1.5	1.5	6	1.5	0.5	1.5	0.5	4
6	2.5	1.5	1.5	1.5	7	2.5	0.5	1.5	1.5	6
7	2.5	0.5	1.5	1.5	6	2.5	0.5	2.5	1.5	7
8	2.5	1.5	2.5	1.5	8	1.5	0.5	1.5	0.5	4
9	1.5	0.5	2.5	0.5	5	0.5	0.5	2.5	0.5	4
10	1.5	1.5	2.5	1.5	7	1.5	0.5	2.5	0.5	5
11	1.5	0.5	1.5	1.5	5	1.5	0.5	1.5	1.5	5
12	2.5	1.5	1.5	0.5	6	1.5	0.5	1.5	1.5	5
13	1.5	1.5	2.5	1.5	7	0.5	0.5	2.5	1.5	5
Average	1.8	1.2	2.0	1.2	**6.2**	1.4	0.5	1.7	1.0	**4.6**

Closer examination of these categories reveal some additional data. It was expected that the locker activities would provide the largest time savings. However, the impact may have been even greater than the data reflects, as the option of "<1 hour" was chosen by every participant. While this was quantified as 0.5 hours, it was possible that they meant 0 hours. This would have increased the total reduction to 34%. One unexpected result was that pack-out time was reported to drop by 0.3 hours. The pack-out process remained the same, and only the buckets moved inside. This reduction may be a sign of skewed data reporting, or instructors may be including the old process of bringing the buckets in from the lockers. The one instructor who stated their prep time increased marked only an increase in pack-out time.

With regards to years spent instructing or number of courses instructed during the season of interest (questions 2 and 3), there was no significant correlation between time spent on prep before or after the changes. There were, however, improvements across the board. This shows that these improvements not only helped instructors who had not established prep patterns but also those who had essentially standardized their own process over the years.

B. Standardization

There were more tools for evaluating the level of standardization, but some this data was harder to quantify. By using results from the survey, comparing photos and documents from key areas, and talking to instructors, I was able to determine the extent of the increase in standardization, as well as the impacts of this.

From the survey, I mostly relied on questions 5 and 7 [Table 4.3]. These compared the number of times an instructor visited each room. The checklist is set up so that an instructor following it sequentially would only visit the locker, supply room, and student gear room once. In the initial conditions, instructors visited those locations 5.0, 5.3, and 3.3 times on average, respectively. After the changes, these were reduced to 2.0, 3.6, and 2.2 times on average, respectively. Thus, they reported a more standardized process.

Table 4.3: Averaged survey responses for questions 5 and 7

Instructor	Visits BEFORE CHANGES [1-3, 4-6, 7-9, 10+]				Visits AFTER CHANGES [1-3, 4-6, 7-9, 10+]			
	Locker	Supply Room	Student Gear Room	Total	Locker	Supply Room	Student Gear Room	Total
1	5	5	5	15	2	2	2	6
2	5	2	5	12	2	2	2	6
3	2	11	2	15	2	8	2	12
4	No response				2	2	2	6
5	5	5	2	12	2	2	2	6
6	5	5	2	12	2	5	2	9
7	5	5	2	12	2	2	2	6
8	5	5	5	15	2	2	2	6
9	5	2	2	9	2	2	2	6
10	8	8	5	21	2	5	5	12
11	5	5	2	12	2	5	2	9
12	5	2	2	9	2	2	2	6
13	5	8	5	18	2	8	2	12
Average	5.0	5.3	3.3	**13.5**	2.0	3.6	2.2	**7.8**

Comparing photos showed a number of improved systems as well. The inventory lists in the supply room, lockers, and navigation box now reflect the current best practices. The many versions of each inventory list, such as the boat inventory [Figure 4.1], have been taken out of circulation. The inventories for most items have been consolidated, so there is only one place to look for/restock items. This will be especially helpful with student gear like duffels in the student gear room and when logisticians need to pull extra boat inventory from the lockers [Figure 4.2]. While the instructor prep list already served as a

comprehensive source for necessary activities, items are mostly listed as action verbs rather than just nouns, which helps clarify what exactly needs to be done.

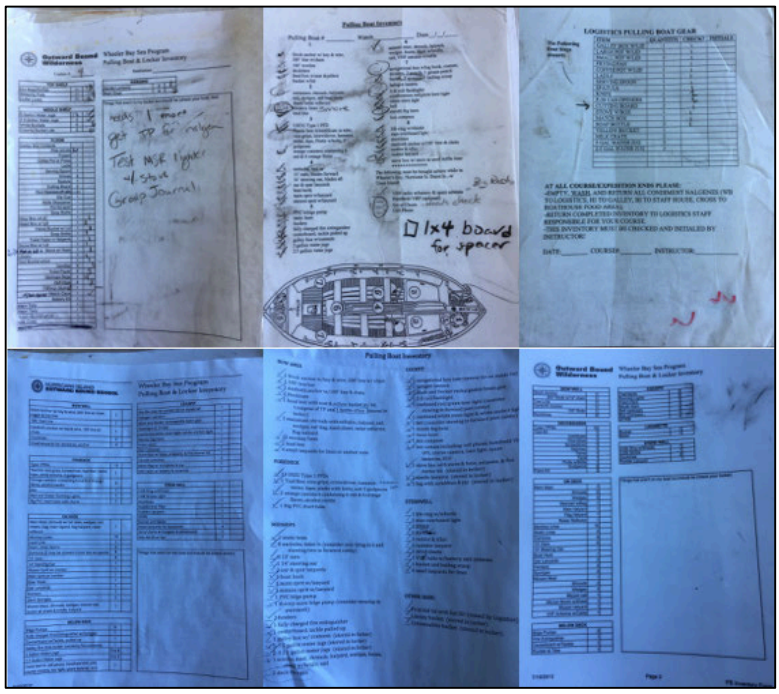


Figure 4.1: Old versions of boat inventory lists

Figure 4.2: Inventory locker comparisons

Unfortunately, the pictures also reveal a lack of documentation and labelling. The old, incorrect locker labels are difficult to remove, and the tape labels that I placed over them were temporary and not easy to read from a distance. It is still quicker to use the paper locker map when searching for some inventory items. Also, the labels installed in the supply room during 2016 had started to fall off, and others were no longer applicable when the comms were added to the shelves. The student gear room lacks labels as well. Similar items are still grouped together, but a lack of consistent labeling can quickly lead to disorganization.

In general, sustainability of the system is an important signifier of proper standardization; if the process is complete and well-standardized, then it will be repeatable and stable over multiple seasons. Julia Makowski and Jilli Miller provided feedback on how the changes had held up at the end of the season, about two months after completion. Jilli Miller noted that LCs made fewer and more productive trips to the lockers because they know exactly what is in them. She also worried about instructor accountability, saying the quality of affairs left by departing instructors could be unacceptable. To check this possibility, I included a question on the survey (question 8) to determine whether instructors were experiencing quality issues. All said that they found the boat in acceptable condition, though this is something to be monitored in the future.

Some instructors also mentioned in conversations and in question 9 that their stress levels initially increased as they confronted the new process and layout. This points to a lack of clear documentation of changes to ease the transition. The checklists were updated, but the new layout and process was not detailed explicitly to instructors and labeling was unclear as stated above. While this is a temporary problem for this study, it could be a

recurring issue if more improvements are to be made and documented poorly. Over time, this would lead to serious distrust of changes.

C. Other Observations

There were also some tangential learnings during this study, specifically in the areas of waste and project management. Initially I had noticed much space occupied by broken, "retired," or irrelevant items. These took up a couple shelves in the supply room, lined the eaves of the student gear room, and filled multiple lockers. My initial reaction was to throw away this non-value-adding material, freeing valuable space and time that LCs spent re-evaluating it every season. This garnered a quick and negative response from multiple staff members who saw both the residual value in this gear and the environmental cost of disposal.

There are a couple possible explanations to this difference of perception in regards to the value of broken gear. The first is the differing priorities of manufacturing and nonprofit operations. The CME has an indifferent attitude towards waste, throwing away or recycling wood, metal, and plastic cutoffs. The factories visited with the manufacturing classes had a similar approach. They were looking to reduce scrap but still filled dumpsters every day with slightly defective parts. The cost/benefit analysis judged repair or rework too costly. As HIOBS is a small nonprofit, buying new gear every season to replace the broken buckles and torn fabric would be unsustainable, so broken gear is often repaired. However, the labor cost of repairs is not often considered, so certain repairs actually end up costing a significant amount. HIOBS may be overvaluing materials and undervaluing labor.

An alternative explanation to the aversion to waste lies in the Leave No Trace principles we teach. HIOBS has a strong environmental connection, so we strive to model this to our students. By throwing out large amounts of broken but possibly salvageable materials, that was ultimately value wasted and environment unnecessarily polluted. I had not considered these negative externalities, but other instructors were cognizant of them. From an accounting approach, these effects need to be quantified and internalized. That way they can be considered when deciding what type of gear to invest in, when to perform repairs, and what happens to our materials when we really decide to "retire" them.

Retrospectively, there were many lessons in project management and planning. I started this project with a vague idea of areas I knew could be beneficially altered, but I had not developed the structure needed for a proper study. This was especially evident in my evaluation criteria, which evolved as the study progressed. By the time I was considering time studies seriously, it was already time to start implementing changes and I did not want to be behind by multiple days. Likewise, the pictures taken of the initial conditions are comprehensive, but they do not highlight the aspects I eventually changed. The survey could have had a 100% response rate had I developed it during the summer because every instructor completes post-course paperwork, and I could have easily included these questions. I also performed the study individually to reduce the obligations on other staff, with advising from Jilli Miller and Julia Makowski. Having a second set of hands may have alleviated the dearth of proper labeling, which I judged was too time-consuming to perform in progress.

D. Summary of Results

Based on the data gathered through pictures, diagrams, checklists, interviews, and a survey, I was able to assess whether the changes made during this study had any measurable effect on the HIOBS prep process. In terms of reduced time, the survey shows that there was a significant improvement, at least 25% on average. The evidence of standardization paints a mixed picture, with some clear improvements such as single-point inventories and shortcomings like labeling. In essence, this proves the thesis argument that manufacturing principles have applications outside of factory environments.

While HIOBS may not be interested in applying these methods purely for cost reduction, they should arguably pursue them for improved course preparation and execution. HIOBS also has different priorities than manufacturing, so limitations on waste and infrastructure for improvements may hamper the fullest implementation. If this process were repeated, more detailed planning and progress documentation would alleviate much of the stress on instructors, as well as improve data collection and analysis. Even so, this study should be considered a success, a step in the right direction. Further improvements based on these principles will be discussed in the following chapter.

CHAPTER 5: RECOMMENDATIONS

In the spirit of *kaizen*, or "continuous improvement," there are a number of additional actions that can be taken to further this study. These are continuations of the changes made, additional areas where TPS principles can be used, and corrections based on the results and observations. Because time is not a restraint for these ideas, they are not subject to the limitations placed on this study. They will address the prep process, but also the connected areas of inventory management and gear clean. Some of them require new fixtures or infrastructure. Within this broader scope, the recommendations represent a small number of the most promising or necessary actions.

A. Food Prep

The process of food preparation is most similar to a traditional factory operation, so many principles can be easily applied to this area. In keeping with the changes made in other rooms, the process and layout can be better integrated. The pack-out list [Figure A.6] that is generated from the menu spreadsheet is used by all of the staff packing food, so it is placed in a central location. Staff gather items and check them off as they are packed. By regrouping the pack-out list according to the sections of the pack-out room, the list can be cut up for instructors to carry with them to the corresponding section [motion]. This pack-out list also lists the ingredients needed for each meal on the reverse [Figure A.7] The students use this on course to manage their supplies, but the "recipes" only list the name of

the item, not the quantity used. Listing the quantity would help students portion better on course and reduce the amount of returned waste [defects].

The tools used during pack-out can also greatly be improved. Since many dry goods come in bulk, they are stored in large tubs and scooped by the cupful into bags for the expedition. A feeder similar to that at a candy store could be used instead, with a scale mounted below. Staff would open the spout into the bag and stop at the appropriate weight [over-processing]. A similar system could be employed for filling spice containers and stocking cans. This would reduce old inventory from piling up and could reduce spills [sweep].

Because the food bucket storage was moved from the lockers to the pack-out room, there was confusion about where to dry them. Some ended up on the ground by the pack-out room door, some by the lockers, and some on the stairs. By building a drying rack near the pack-out room door, the buckets would have a clear place to dry near their storage [standardize]. It was also discovered that there are over 10 sizes of plastic Nalgene containers and lids used for expedition food storage. These can be standardized and placed near their contents [sort].

B. Supply Room, Lockers, and Student Gear Room

The layout of the lockers, student gear room, and supply room was changed significantly. However, the lack of accompanying documentation and signage created some confusion for returning staff. To reduce the degradation of the organizational systems and instructor buy-in over the coming seasons, it is critical to make storage intuitive, flexible, and sustainable.

Labeling is one of the most necessary additions [standardize]. While these were not implemented due to time constraints, they should be included in any future improvements. Without proper signage, instructors are not able to fully trust changes made. These labels need to be durable and easy to read but also movable. Permanent labeling discourages flexibility, and it can even lead to mislabeling. This was the original state of the lockers, one as bad as no signage at all. In addition to per-item labels, area maps at the entrance of the supply room, student gear room, and on the side of the lockers would help staff quickly navigate these inventory areas.

In addition to this signage, physical separation of individual inventories could help instructors use the system [set in order]. This could also address the issue of gear being left in the hallway for outgoing crews. A set of cubbies can be used to store the med kit and comms kit for each expedition [standardize] [sweep]. Another area of trouble mentioned in the survey was the storage for large charts, which are currently left in a flat stack. As there are over 30 different chart versions, it can be tedious to search for a replacement. By putting them upright, like a magazine rack, they can be easily searched for the correct chart [set in order]. In addition to these improvements in signage and storage, minimizing the amount of undesignated surfaces for people to dump assorted items will encourage them to utilize the system [sustain].

C. Inventory Management

While addressing inventory management will not directly have much of an impact on prep time, it is connected to all of the gear used on expedition. Keeping track of inventory is mostly a responsibility of logistics staff, but a shortage that is not noticed until

prep can cause delays for instructors. By standardizing the equipment and consumable item life cycles and employing *kanban* measures to storage spaces, it will be easier to keep the appropriate supplies on hand.

As it stands, there is a lifecycle planning document in progress for much of the larger equipment used for expedition [Figure A.16]. It includes suppliers, price, current inventory, amount needed, expected life span, and when to purchase more. However, for items such as VHF radios there are over 4 models in stock, and other items are not on the list at all. Expanding this list to include all gear used on course and phasing out old versions will ensure that inventory is accounted for and instructors have standard operating equipment [standardize]. For categories where there is no standard inventory item, this may require evaluating all possibilities for performance and compatibility with the current system.

One large flaw of the current equipment lifecycle document is the lack of an end plan. While there are lifespans attached to each item, these are estimates based on many years of observation. Almost all of the gear is "retired" only when it is irreparable, though this judgement is up to the logistician or instructor who assesses the damage. As was pointed out in Chapter 4, retired items are usually stored away on base rather than being disposed of. While throwing away this equipment would be against our value of conservation, there are options such as donation and recycling that preserve some of the item's worth. It is necessary to specify what constitutes unusable or retired gear in the lifecycle plan along with its destination to complete the lifecycle of all equipment [sustain]. This will reduce the space dedicated to "retired" storage and help staff assess what to do with damaged gear [inventory] [sort].

The storage for usable inventory can also be improved with kanban measures. The pack-out room, supply room, student gear room, med kit room, and inventory lockers all contain inventories of consumable items that occasionally need restocking. These are currently done by irregular reorders whenever an item runs out, which can cause delays or changes in the prep process. By marking a minimum acceptable inventory, logisticians will be able to proactively order supplies. For example, the food dispensers mentioned previously in the chapter could be designed to hold two packages worth of food with a line marked at the fill level of one package. When the supply drops below the line, logistics know to order another box which will be able to fit in the dispenser. A similar marking can be used on shelves to show when an order is needed.

D. Summary of Recommendations

While there are many ways that the processes used by HIOBS at Wheeler Bay can be improved, these have the possibility of the highest impact for the lowest cost. They represent a continuation of the study and do not involve large investments in capital or personnel. As Ohno states, “manual work kaizen means thinking of better ways of using the existing equipment” rather than simply buying systems that work faster [Ohno 115]. Some of the above are aimed at achieving time reductions in the prep process, while others seek to reduce stress and material waste.

For the pack-out room, the recommended changes may reduce the 1.7 hours needed to under 1 hour. Since 4 people are usually involved, this is really almost 3 labor hours saved with relatively simple changes. The improvements in the supply room, locker, and student gear room will make navigation around base easier and promote system

sustainability, something very important for high-turnover, seasonal employees. Finally, the suggestions for inventory management will help staff plan ahead to reduce consumption and waste. In this case, these manufacturing principles can help HIOBS stay true to its values of conscious consumption and environmental protection.

CHAPTER 6: CONCLUSION

This study explores the application of lean manufacturing principles outside of their traditional production environment. After seeing how to implement them successfully in my CME classes, I was able to visualize how the prep process at HIOBS could be improved in a similar way, for the benefit of staff and students alike. By recording the initial conditions, developing a methodology, implementing changes, and gathering data, I was able to evaluate the impacts of the changes. Indeed, the prep time was reduced significantly for almost all instructors that reported times. Now that these principles are proven in this unique environment, further improvements in standardization and time reduction are possible.

The changes attempted to integrate the layout with the process, elements that had largely been addressed separately before this study. The primary tools used were elimination of the 7 wastes and implementation of 5S practices, and these were focused primarily on the instructors' logistical prep activities like gathering gear for the boat. The elimination of locker storage created a cascade of other adjustments that moved containers closer to their contents and ultimately moved a lot of supplies closer to its final destination, the boat.

In the terms of the thesis question, this study was a success. The time needed for the prep logistics was reduced by 25%, and standardization was improved through updated checklists and logical layouts. This helped new instructors act autonomously during prep, increased the time instructor pairs have to develop a relationship, and

ultimately increased the preparedness of instructors for the rigors of the expedition. While most manufacturing improvements are evaluated in cost reductions, the goal of this study is focused on shifting instructors' time commitments. Even with further efficiency improvements, instructors will be present for two days of prep in order to build the connections necessary to teach and manage students.

Personally, this study provided a chance to test the skills developed during my college education and revealed areas where improvement is needed. To successfully manage the project, I had to plan ahead for the methodology and timeline, solve problems outside with few restrictions or known variables, figure out how to effectively collect data, and ultimately follow through on all of the commitments I had started. Combining these two distinct worlds of manufacturing and experiential education also revealed some of the shortcomings of both systems. In manufacturing, waste in the process is highly scrutinized, but scrap material is thrown away in large amounts. The environmental costs are rarely internalized, usually only when it is required by regulation. On the other hand, HIOBS is incredibly reluctant to throw away "retired" items, insisting that they still have value. In both cases, the full lifecycle of the materials and product should be considered more closely, taking the financial and environmental costs into account. Finally, focusing this time and effort on understanding and improving the logistics at HIOBS gave me invaluable career experience. I have been hired as the Head Logistics Coordinator, responsible for managing food and gear, implementing improvements, and managing other Logistics Coordinators. The work presented in this thesis will be continued, improved, and evaluated to further benefit the staff and students of the Hurricane Island Outward Bound School.

APPENDICES

2016 WHEELER BAY SEA PROGRAM: 2016 CD PREP & PAPERWORK E-TRAIN COURSE NUMBER:_____STAFF:_____

See also: Course Director Guide and PAPERWORK LOP / EGNYTE: fieldstaff/2Serve2Strive **CHROME!!!!** IR's:obir.herokuapp.com hiobsCDSea/hiobsCDSea updated: 7.12.16

COURSE PREP

- ☐ Read Medicals (print page 1s)
- ☐ Plan Prep
- ☐ Timesheets (Email to PM Friday before PP ends)
- ☐ Pull pins/remove plastic
- ☐ Consider Service options

PW PRINT OR PULL

- ☐ Instructor checklists prep/end
- ☐ Exped. Plan: Approved by CD
- ☐ Copy Exped. plan, Pg. 1s and Roster into CD On-call pouch
- ☐ Roster on wall clipboard and on-call pouch
- ☐ Certificates (printed by Course Advisor in Camden)/sign
- ☐ Travel List-all set?
- ☐ Paperwork Field Packet:
  1. IR's
  2. Med. Health Log/ Page Ones
  3. Worker's Comp. First Report
  4. ECG
  5. Health Care Provider
  6. Early Departure
  7. Patient Assessment Form
  8. Undisclosed Issues Worksheet
  9. Pre-flight check list
  10. FROI sheet
  11. Scholarship Student Info
  12. CIF (if applicable)
  13. Roster
  14. Clothing List
  15. Course Description
  16. Course End Checklist

Memory Stick

- ☐ Evals/INST/CD
- ☐ Course Report

Logistics

- ☐ Comms.
- ☐ Charts, Nav box
- ☐ Med Kit
- ☐ Menus
- ☐ Gear /Logistics talk/day one
- ☐ Gear List From INST's Day One prep
- ☐ Check in about resupplies, capsize, transports, course end, all logistics needs and support

COURSE START

- ☐ Let Admissions and PMs know ALL students have arrived
- ☐ Undisclosed issues reported to PD
- ☐ "All Aboard" email to parents or contract contact (with picture if possible)
- ☐ Consider dinner with group
- ☐ Pre-flight check list completed by CD/INST's before exped. departure

DURING COURSE

- ☐ E-Mail "Morning Update" Daily field update
- ☐ Organize course end paperwork on memory stick
  1. SPIFF Student Program/Instructor Feedback Form (Fill in optional, then Print)
  2. Staff Evals
  3. CD Eval
  4. Course report
- ☐ Print SPIFF Evals
- ☐ Print Sponsor Letters/Blank
- ☐ Email "Mid-Course Update" when possible after visiting course in the field
- ☐ Check in with logistics about course end plan

COURSE END

- ☐ Take pictures of scholarship students, email w/ student name to ksmith@hiobs.org
- ☐ Help with SPIFFs
- ☐ Encourage Instr./Student course end check-ins
- ☐ Course end circle
- ☐ Email "Heading Home" to parents

POST COURSE (Students have left)

- ☐ Student Evals:
  1. Proof read and correct
  2. Print, have instructors sign
  3. Upload to EGNYTE
- ☐ Service Letters
  1. Print
  2. Upload to EGNYTE
- ☐ Staff Evals (make sure they are all signed):
  1. Write CD Summary
  2. E-mail to PM/Staffing Mngr
- ☐ Course Report: completed:
  1. uploaded to EGNYTE
  2. E-mail to PM
- ☐ IR's:
  1. Enter into DB, w/ completed analysis
  2. IR Hard copies and notes go into course folder
- ☐ Exped. Plan: Updated and filed in course folder
- ☐ Field Page ONES filed in course folder

TO COURSE FOLDER:

- ☐ Certs
- ☐ Roster
- ☐ Updated Exped. Plan
- ☐ Field Page Ones (with completed health info for ALL students)
- ☐ Student Service Letters
- ☐ Student Evals written by Instructors
- ☐ IR Field copies and notes
- ☐ Sponsor Letters
- ☐ SOLO Letters, Labeled with send date
- ☐ Course Camera Photo Card (labeled in plastic zip bag)

Figure A.1: CD course support checklist

2017 Logistics Course Support Checklist:

Prep for Prep

- **Watch Locker**
  - Make/Check locker prior to course prep, this should be quick and easy since the locker should've been inventoried by previous logisticians and prior instructor if different at course end.
  - Obtain any missing items.
  - Note locker number and combo on whiteboard in logistics office.
- **Comms**
  - Charge for course.
  - Check out on sheet in logistics office.
  - Record cell # and camera on white board in logistics office.
  - Place items in yellow box and leave in hallway under labeled boat.
- **Other Gear for Hallway**
  - Nav Box – list in supply room, make sure nav box and ships log matches boat.
  - Chart Kit – check kit, ensure white board and all charts are clean and ordered.
  - Student Handbooks, Mugs, Whistles.
  - Med Kit – check thoroughly and label with initials when done. Leave Epi out to be double checked by instructor.
- **Logistics Pre-Course and Request Form**
  - Customize form according to any new updates. Designate locker #, weatherport, cell #, course camera, food pack-out day and more.
  - Print and have accessible for day 1 of course prep.

Course Prep

- **Brief**
  - If available on day 1, set up a time with course CD to brief instructors on Pre-Course form and any logistics updates.
  - Ensure instructors have a 2017 Sailing Menu and BBQ/Burrito Bar and Staff Solo Menus.
- **Be available to answer questions and meet requests.**
- **Food Pack Out**
  - Once menu is completed by instructors run it through the excel program and print pack-out guide.
  - Highlight any items you know we do not currently have in stock.
  - Be available to assist during initial food pack-out.
  - Compile shopping list for missing food items and coordinate with other logistics staff to run errands.
  - You or the CD should be around to help out on the float.
- **Gear Clean**
  - Set up prior to course arrival.
  - Brief gear clean, and be available for questions and assistance. Help out with tasks but ultimately instructors are responsible for student management.
  - Make sure instructors are aware that they are responsible for making sure all gear gets put away.
  - Instructors are responsible for collecting money from students for any lost or damaged gear. They can refer to price sheet on locker clipboard.
- **End of Course Banquet Food**
  - Shop for, pack, and clearly label food for BBQ, Burrito Bar or other.
  - Make potato salad or cole slaw if necessary
  - Make sure course is adequately provided necessary cooking equipment (ex. Grill) and propane (if they are out).
- **PCE and/or Cupolas**
  - Refer to logistics request sheet and coordinate with CD, instructors and other logisticians to provide appropriate support.
- **School Store**
  - Responsible for running the school store, keep a clear list of items purchased with course #, date, and your name in back box.
- **Transport**
  - Coordinate with CD to ensure travel plans are taken care of.
- **Locker Check**
  - With instructor, go through locker inventory sheet, making sure that everything is accounted for.
  - Obtain any missing items.
- **Comms, Nav Box, and Chart Kit Check in**
  - Check that comms are working (instructors should be doing this as well).
  - Charge necessary items and check in on sheet.
  - Return to appropriate location in supply room.
  - Check nav box and chart kit, ensuring they are complete. Return to supply room.
- **Med Kit**
  - Return to Med Supply Room.
  - If time allows, check and resupply initialing when complete.
- **When everything is complete clear course info from logistics whiteboard and get ready for the next one!**
  - When shopping is complete finish pack out, make any necessary hummus and/or granola bars.
  - Ensure food pack-out and menu is completed and left in one of the dry food crates for the course.
  - Have instructors pack out dry goods and cans for resupply.
- **Propane** – locate and place in yellow fuel locker (coordinate with email run to fill propane if necessary)
- **Travel Plans**
  - Communicate with CD to make a pick-up plan
  - If you are doing the pick-up see "Airport Pick-Up" sheet on travel clip board to ensure you have all necessary items.
  - (Bring student snack for return trip.)
- **Check student heads and weatherport** – it is the responsibility of the last course to clean these but doing a last minute check and sweep never hurts. Make sure weatherport has galley box and stove to use.

Course Start

- **Course pick-up and/or around to help with last minute logistical needs. Coordinating capstar plans with CD and instructors.**

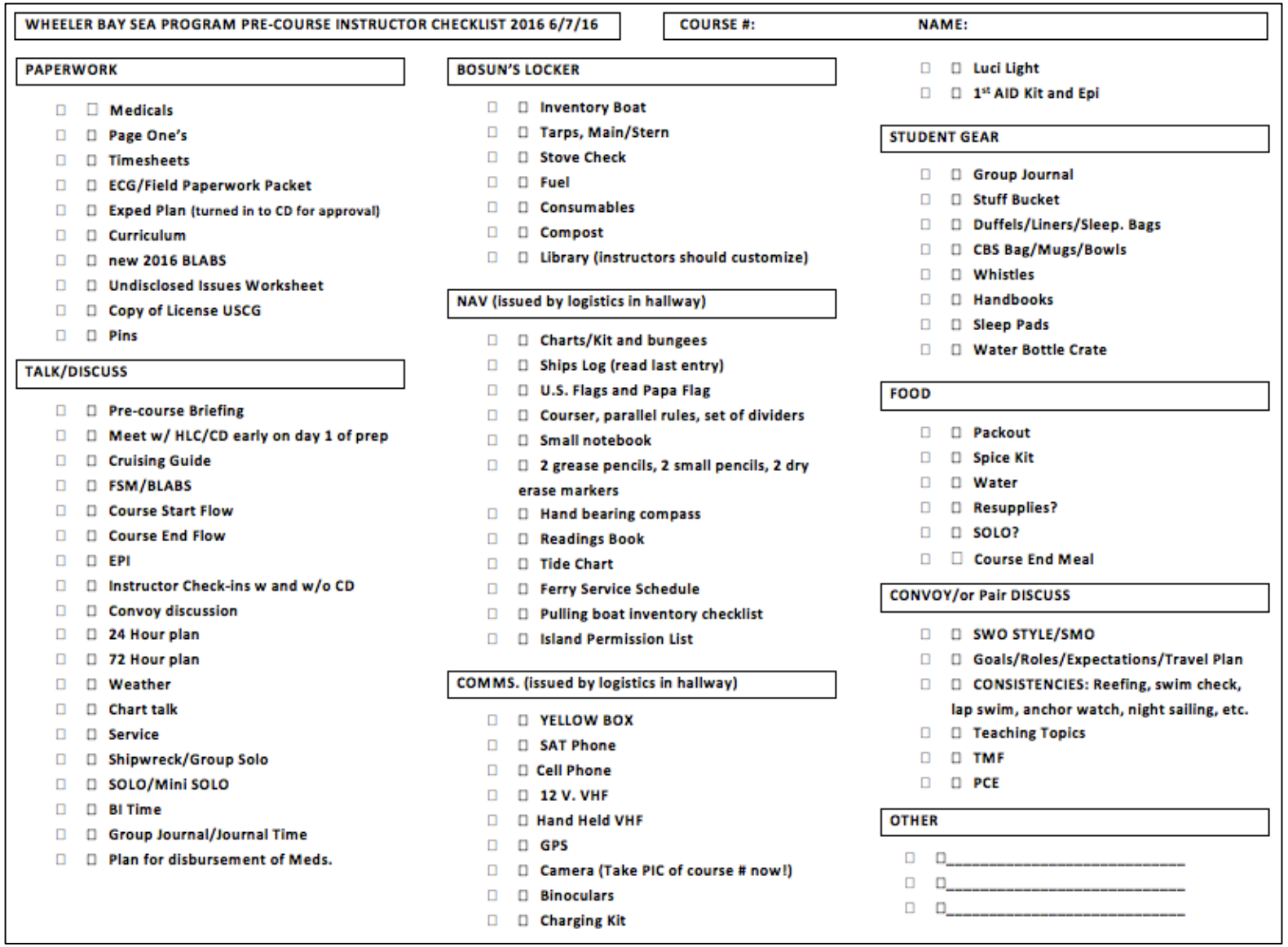
During Course

- **On Call**
  - While working every week you will be "On Call" for 2-3days at a time. This means you will carry the Logistics On Call phone with you everywhere and always be in a fit state to drive or stay with a student in case of an emergency or student evacuation.
  - See "Evacuation Checklist" and "Student on Base" lists in binder for additional instructions. Coordinate with CD.
- **Resupply**
  - Refer to logistics request sheet and coordinate with CD resupply plans – where, when, what, how, who.
  - Food: ultimately you are responsible for all food pack-out, staff solo menus and special requests. Leave clear directions and speak directly with someone who will be delivering the resupply if that is not you.
  - Don't forget to check the Burnt Locker and send out any necessary resupply items for IH staff house and store water!

Course End

- **Ring the Bell! And meet the boat when they come in!**

Figure A.2: LC course support checklist



WHEELER BAY SEA PROGRAM PRE-COURSE INSTRUCTOR CHECKLIST 2016 6/7/16

COURSE #: **NAME:**

PAPERWORK

- ☐ ☐ Medicals
- ☐ ☐ Page One's
- ☐ ☐ Timesheets
- ☐ ☐ ECG/Field Paperwork Packet
- ☐ ☐ Exped Plan (turned in to CD for approval)
- ☐ ☐ Curriculum
- ☐ ☐ new 2016 BLABS
- ☐ ☐ Undisclosed Issues Worksheet
- ☐ ☐ Copy of License USCG
- ☐ ☐ Pins

TALK/DISCUSS

- ☐ ☐ Pre-course Briefing
- ☐ ☐ Meet w/ HLC/CD early on day 1 of prep
- ☐ ☐ Cruising Guide
- ☐ ☐ FSM/BLABS
- ☐ ☐ Course Start Flow
- ☐ ☐ Course End Flow
- ☐ ☐ EPI
- ☐ ☐ Instructor Check-ins w and w/o CD
- ☐ ☐ Convoy discussion
- ☐ ☐ 24 Hour plan
- ☐ ☐ 72 Hour plan
- ☐ ☐ Weather
- ☐ ☐ Chart talk
- ☐ ☐ Service
- ☐ ☐ Shipwreck/Group Solo
- ☐ ☐ SOLO/Mini SOLO
- ☐ ☐ BI Time
- ☐ ☐ Group Journal/Journal Time
- ☐ ☐ Plan for disbursement of Meds.

BOSUN'S LOCKER

- ☐ ☐ Inventory Boat
- ☐ ☐ Tarps, Main/Stern
- ☐ ☐ Stove Check
- ☐ ☐ Fuel
- ☐ ☐ Consumables
- ☐ ☐ Compost
- ☐ ☐ Library (instructors should customize)

NAV (issued by logistics in hallway)

- ☐ ☐ Charts/Kit and bungees
- ☐ ☐ Ships Log (read last entry)
- ☐ ☐ U.S. Flags and Papa Flag
- ☐ ☐ Courser, parallel rules, set of dividers
- ☐ ☐ Small notebook
- ☐ ☐ 2 grease pencils, 2 small pencils, 2 dry erase markers
- ☐ ☐ Hand bearing compass
- ☐ ☐ Readings Book
- ☐ ☐ Tide Chart
- ☐ ☐ Ferry Service Schedule
- ☐ ☐ Pulling boat inventory checklist
- ☐ ☐ Island Permission List

COMMS. (issued by logistics in hallway)

- ☐ ☐ YELLOW BOX
- ☐ ☐ SAT Phone
- ☐ ☐ Cell Phone
- ☐ ☐ 12 V. VHF
- ☐ ☐ Hand Held VHF
- ☐ ☐ GPS
- ☐ ☐ Camera (Take PIC of course # now!)
- ☐ ☐ Binoculars
- ☐ ☐ Charging Kit
- ☐ ☐ Luci Light
- ☐ ☐ 1st AID Kit and Epi

STUDENT GEAR

- ☐ ☐ Group Journal
- ☐ ☐ Stuff Bucket
- ☐ ☐ Duffels/Liners/Sleep. Bags
- ☐ ☐ CBS Bag/Mugs/Bowls
- ☐ ☐ Whistles
- ☐ ☐ Handbooks
- ☐ ☐ Sleep Pads
- ☐ ☐ Water Bottle Crate

FOOD

- ☐ ☐ Packout
- ☐ ☐ Spice Kit
- ☐ ☐ Water
- ☐ ☐ Resupplies?
- ☐ ☐ SOLO?
- ☐ ☐ Course End Meal

CONVOY/or Pair DISCUSS

- ☐ ☐ SWO STYLE/SMO
- ☐ ☐ Goals/Roles/Expectations/Travel Plan
- ☐ ☐ CONSISTENCIES: Reefing, swim check, lap swim, anchor watch, night sailing, etc.
- ☐ ☐ Teaching Topics
- ☐ ☐ TMF
- ☐ ☐ PCE

OTHER

- ☐ ☐_____
- ☐ ☐_____
- ☐ ☐_____

Figure A.3: Old instructor prep checklist

Pre-Course Fact Sheet and Logistics Requests Form 2017

Course Number: _____ Logistics Coordinator(s): _____

Instructors: _____

CD: _____ Weatherport: _____

PB: _____ Locker: _____ Combo: _____

Cell #: _____ Course Camera: _____

Notes:

- **Locker** has been checked by LC *consumables and library have been restocked by last locker user*.
- **Issued in hallway:** Charts, Compass, Nav Box, Med Kit w/Epi, Mugs, Whistles, & Handbooks.
- **Propane** will be in locker by the end of **Prep Day** ___
- **Extra Supplies Requests need to be turned into LC by 1500 on Prep Day 1**
- Please Return **Sailing Menu** to LC by end of prep **day 1 or by lunch** if you are packing food today
- **Food Pickout** can happen on Prep Day ____
- Please make sure to note any extra gear borrowed and leave list on appropriate clipboard in hallway, indicating size, color, and item description.

Logistics Requests

(Please return to clipboard by 1500 on Prep Day 1)

Pre-Course Requests (missing supplies and/or extra items needed):

(Continued on back)

COURSE START (Needs/notes/requests including capsize drill, etc.):

Resupply #1 Date and Time: _____ Location: _____

_____ # of Fish Crates, # of Milk Crates YES NO Spice and Condiment Resupply Needed

YES NO Propane Resupply YES NO Water Resupply _____ # of Water Jugs Needed

Notes:

Resupply #2 Date and Time: _____ Location: _____

_____ # of Fish Crates, # of Milk Crates YES NO Spice and Condiment Resupply Needed

YES NO Propane Resupply YES NO Water Resupply _____ # of Water Jugs Needed

Notes:

Burnt Island Time

ROCKS Date and Time: _____ Type of Support needed: _____

SOLO Date and Time: _____ ____ # of Students ____ # of Instructors

Food Allergies (be specific- # of students, type of allergy, etc.): _____

***SOLO* Special Requests/Needs:**

COURSE END (Needs/notes/requests including capsize drill, marvelton, etc.):

***Post Course** (Will you be staying on base after course? If so, for how long and any specific staff food requests? Logistics staff will try our best to accommodate all reasonable requests):*

***Optional Course End Meal** (Please choose one): Date of Meal: _____*

BBQ Pack Out Menu

Date of BBQ: _____ Course #: _____ CD: _____

Instructors: _____

# of Students & Staff at BBQ: _____ # Of Vegetarians: _____

Other Food Allergies and Notes:

*Note: Please request number of vegetables needed. And please be reasonable in your requests!

Item	Unit	Qty.
Burgers	6a (limit is 1 per person)	
Chicken Burgers	6a (only for those who don't eat beef)	
Veggie Burgers	as needed	
Hot Dogs	6a (limit is 1 per person)	
Burger Buns	18ct	
Hot Dog Buns	24ct	
Lettuce*	1head	
Tomatoes*	6ct	
Onions*	6ct	
Peppers	6ct	
Ketchup	1bottle	
Mustard*	1bottle	
Potato salad		
Cole slaw		

Per Logistics Use Only

Ordered/Purchased: _____

_____

Packed (Date): _____

Packed By: _____

* Check the course's mailbox for these items before packing out new items.

Burrito Bar Pack Out Menu

Date of Meal: _____ Course #: _____ CD: _____

Instructors: _____ # of Students & Staff at Meal: _____ # Of Vegetarians: _____

Other Food Allergies and Notes:

Logistics Use:

Item	Unit	Check for YES* (& other notes!)
Black Beans	#10 Can	
Tortillas	2 Pkgs.	
Tomatoes	3	
Green Peppers	2-3	
Potatoes	2	
Onion	1	
Lettuce	1 head	
Cilantro	1 bunch	
Sour Cream	16oz Container	
Salsa	1 jar	
Cheese	1 lb.	
Beef Log	1 (10lb.)	

Ordered/Purchased: _____

_____

Packed (Date): _____

_____

Packed By: _____

* Check the course's mailbox for items.

☐ **Check here if you want Cereal/Milk and Fruit for Last Breakfast on Base**

(This will be packed and provided for you by a logo on your course end date _____)

Figure A.4: Old logistics pre-course request form

2017 Sailing Menu

Instructors:_____

CD: _____ Course number:_____

Total number of eaters (instructors + students):_____

Dietary needs: gluten-free:_____dairy-free:_____peanut allergy:_____

other:_____

Circle: initial pack-out or resupply location:_____date:_____

1) How much food do you need?

Enter the dates covered by this pack-out. Put a 1 or a 2 in the meal/snack boxes for each day, and total the results. Don't forget to add an extra hot, non-perishable meal (like ramen)... just in case!

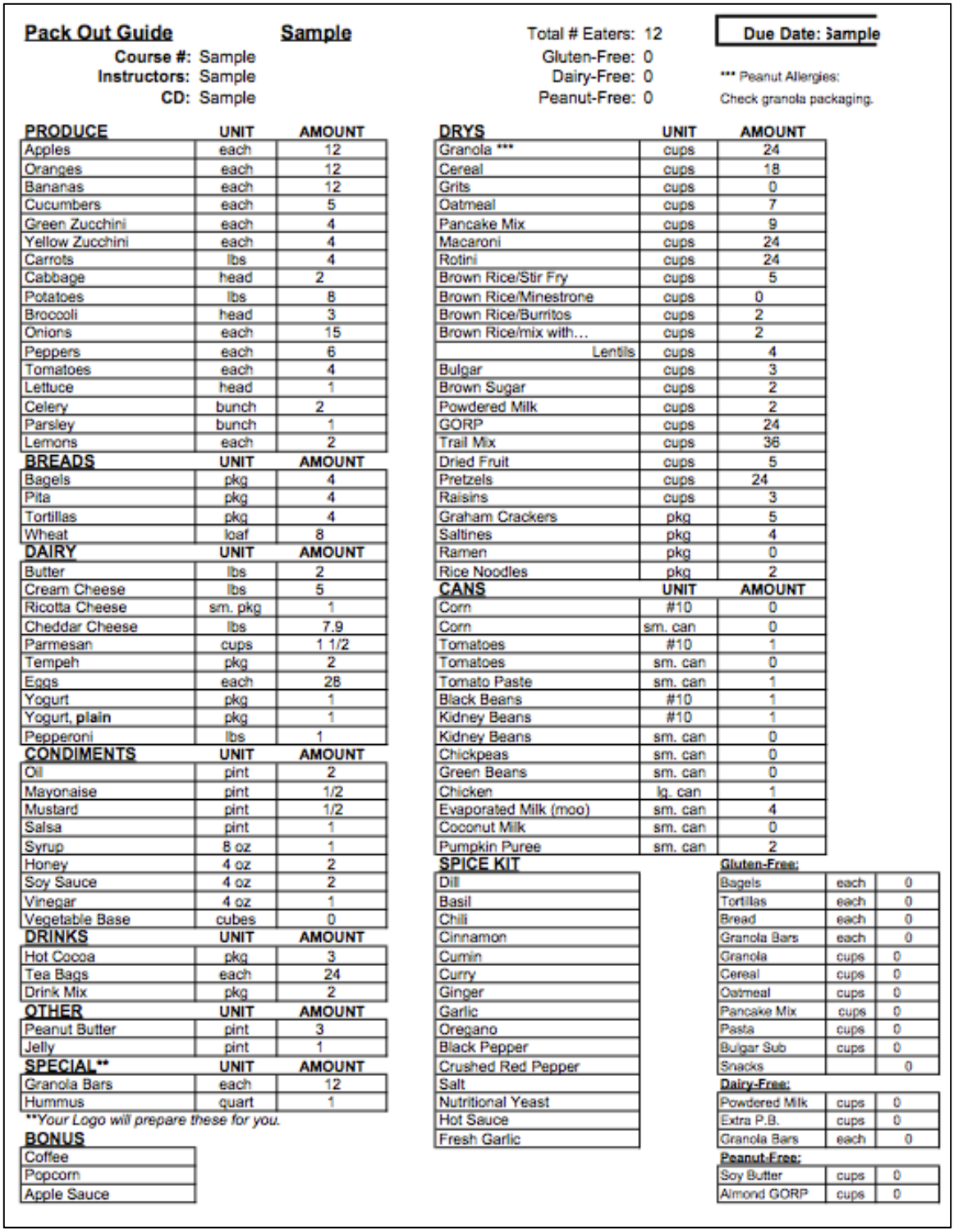
Day	Date	B	L	D	Snax
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
	Total				

2) Select your meals

Use the following lists to choose the meals you want. Indicate how many of each meal in the left column, making sure the totals match the totals you calculated in step 1.

	Breakfast		Lunch
	Granola & milk		PB & J on wheat
	Granola & yogurt		Cheese on wheat
	Cereal & milk		Pepperoni & cheese on tortilla
	Oatmeal & raisins		Tuna on pita
	Bagels & cream cheese		Hummus & cabbage on tortilla
	Eggs & home fries		3-bean salad
	Pancakes & syrup		Sautéed zucchini & wheat
	Grits		Egg salad on wheat
			Cuke & tzatziki on wheat
	Snacks		**Dinner**
	Apples		Mac & cheese
	Oranges		Pasta marinara
	Bananas		Bulgar & kidney bean chili
	GORP		Veggie & tempeh stir-fry
	Snack mix		Black bean burritos
	Dried fruit (mixed)		Corn chowder
	Graham crackers		Curried lentil & rice stew
	Pretzels		Ramen
	Granola bars		Thai peanut pasta
	Saltines		Minestrone soup
	Ants on a log		Tempeh Indonesian soup
			Pumpkin pasta

Figure A.5: Sailing menu selection



Pack Out Guide **Sample**

Course #: Sample
Instructors: Sample
CD: Sample

Total # Eaters: 12
Gluten-Free: 0
Dairy-Free: 0
Peanut-Free: 0

Due Date: Sample

*** Peanut Allergies:
Check granola packaging.

PRODUCE	UNIT	AMOUNT
Apples	each	12
Oranges	each	12
Bananas	each	12
Cucumbers	each	5
Green Zucchini	each	4
Yellow Zucchini	each	4
Carrots	lbs	4
Cabbage	head	2
Potatoes	lbs	8
Broccoli	head	3
Onions	each	15
Peppers	each	6
Tomatoes	each	4
Lettuce	head	1
Celery	bunch	2
Parsley	bunch	1
Lemons	each	2

BREADS	UNIT	AMOUNT
Bagels	pkg	4
Pita	pkg	4
Tortillas	pkg	4
Wheat	loaf	8

DAIRY	UNIT	AMOUNT
Butter	lbs	2
Cream Cheese	lbs	5
Ricotta Cheese	sm. pkg	1
Cheddar Cheese	lbs	7.9
Parmesan	cups	1 1/2
Tempeh	pkg	2
Eggs	each	28
Yogurt	pkg	1
Yogurt, plain	pkg	1
Pepperoni	lbs	1

CONDIMENTS	UNIT	AMOUNT
Oil	pint	2
Mayonaise	pint	1/2
Mustard	pint	1/2
Salsa	pint	1
Syrup	8 oz	1
Honey	4 oz	2
Soy Sauce	4 oz	2
Vinegar	4 oz	1
Vegetable Base	cubes	0

DRINKS	UNIT	AMOUNT
Hot Cocoa	pkg	3
Tea Bags	each	24
Drink Mix	pkg	2

OTHER	UNIT	AMOUNT
Peanut Butter	pint	3
Jelly	pint	1

SPECIAL**	UNIT	AMOUNT
Granola Bars	each	12
Hummus	quart	1

***Your Logo will prepare these for you.*

BONUS
Coffee
Popcorn
Apple Sauce

DRYS	UNIT	AMOUNT
Granola ***	cups	24
Cereal	cups	18
Grits	cups	0
Oatmeal	cups	7
Pancake Mix	cups	9
Macaroni	cups	24
Rotini	cups	24
Brown Rice/Stir Fry	cups	5
Brown Rice/Minestrone	cups	0
Brown Rice/Burritos	cups	2
Brown Rice/mix with…	cups	2
Lentils	cups	4
Bulgar	cups	3
Brown Sugar	cups	2
Powdered Milk	cups	2
GORP	cups	24
Trail Mix	cups	36
Dried Fruit	cups	5
Pretzels	cups	24
Raisins	cups	3
Graham Crackers	pkg	5
Saltines	pkg	4
Ramen	pkg	0
Rice Noodles	pkg	2

CANS	UNIT	AMOUNT
Corn	#10	0
Corn	sm. can	0
Tomatoes	#10	1
Tomatoes	sm. can	0
Tomato Paste	sm. can	1
Black Beans	#10	1
Kidney Beans	#10	1
Kidney Beans	sm. can	0
Chickpeas	sm. can	0
Green Beans	sm. can	0
Chicken	lg. can	1
Evaporated Milk (moo)	sm. can	4
Coconut Milk	sm. can	0
Pumpkin Puree	sm. can	2

SPICE KIT
Dill
Basil
Chili
Cinnamon
Cumin
Curry
Ginger
Garlic
Oregano
Black Pepper
Crushed Red Pepper
Salt
Nutritional Yeast
Hot Sauce
Fresh Garlic

Gluten-Free:		
Bagels	each	0
Tortillas	each	0
Bread	each	0
Granola Bars	each	0
Granola	cups	0
Cereal	cups	0
Oatmeal	cups	0
Pancake Mix	cups	0
Pasta	cups	0
Bulgar Sub	cups	0
Snacks		0

Dairy-Free:		
Powdered Milk	cups	0
Extra P.B.	cups	0
Granola Bars	each	0

Peanut-Free:		
Soy Butter	cups	0
Almond GORP	cups	0

Figure A.6: Ingredient pack-out spreadsheet

MEAL GUIDE

# of Days Covered by This Packout: 8

Breakfast

1 Granola/Milk (granola [1 C per person], powdered milk)
1 Granola/Yogurt (granola [1 C per person], yogurt)
1 Cereal/Milk (cereal [1.5 C per person], powdered milk)
1 Oatmeal/Raisins (oats [1/2 C per person], raisins, brown sugar, moo)
1 Bagels/Cream Cheese (bagels [1.75 per person], cream cheese, butter)
1 Eggs/Home Fries (eggs [2.3 per person], potatoes, peppers, onions)
1 Pancakes/Syrup (pancake mix, syrup, butter)
0 Grits (grits [1/2 C per person], cheese[1/2lb])

Lunch

1 PB & J/Wheat (peanut butter, jelly, bread [1.5 sandwiches per person])
1 Cheese/Wheat (cheese, bread, lettuce, tomato, mayo, mustard [1.5 sandwiches per person])
1 Pepperoni/Cheese/Tortilla (pepperoni, cheese, tortillas, mayo, mustard [1.25 sandwiches per person])
1 Tuna/Pita (tuna, pitas, celery, tomato, mayo, mustard [1.25 sandwiches per person])
1 Hummus/Cabbage/Tortilla (hummus, cabbage, cheese, tortillas [1.25 sandwiches per person])
0 3-Bean Salad (chickpeas, kidney beans, green beans, corn, cukes, onions, peppers, dressing)
1 Sauteed Zucchini/Wheat (zucchini, cream cheese-ricotta spread, onions, bread [1.5 sandwiches per person])
0 Egg Salad/Wheat (eggs, mayo, mustard, celery, onions, peppers, bread [1.5 sandwiches per person])
1 Cuke/Tzatziki/Wheat (cucumbers, tzatziki sauce, peppers, onions, bread [1.5 sandwiches per person])

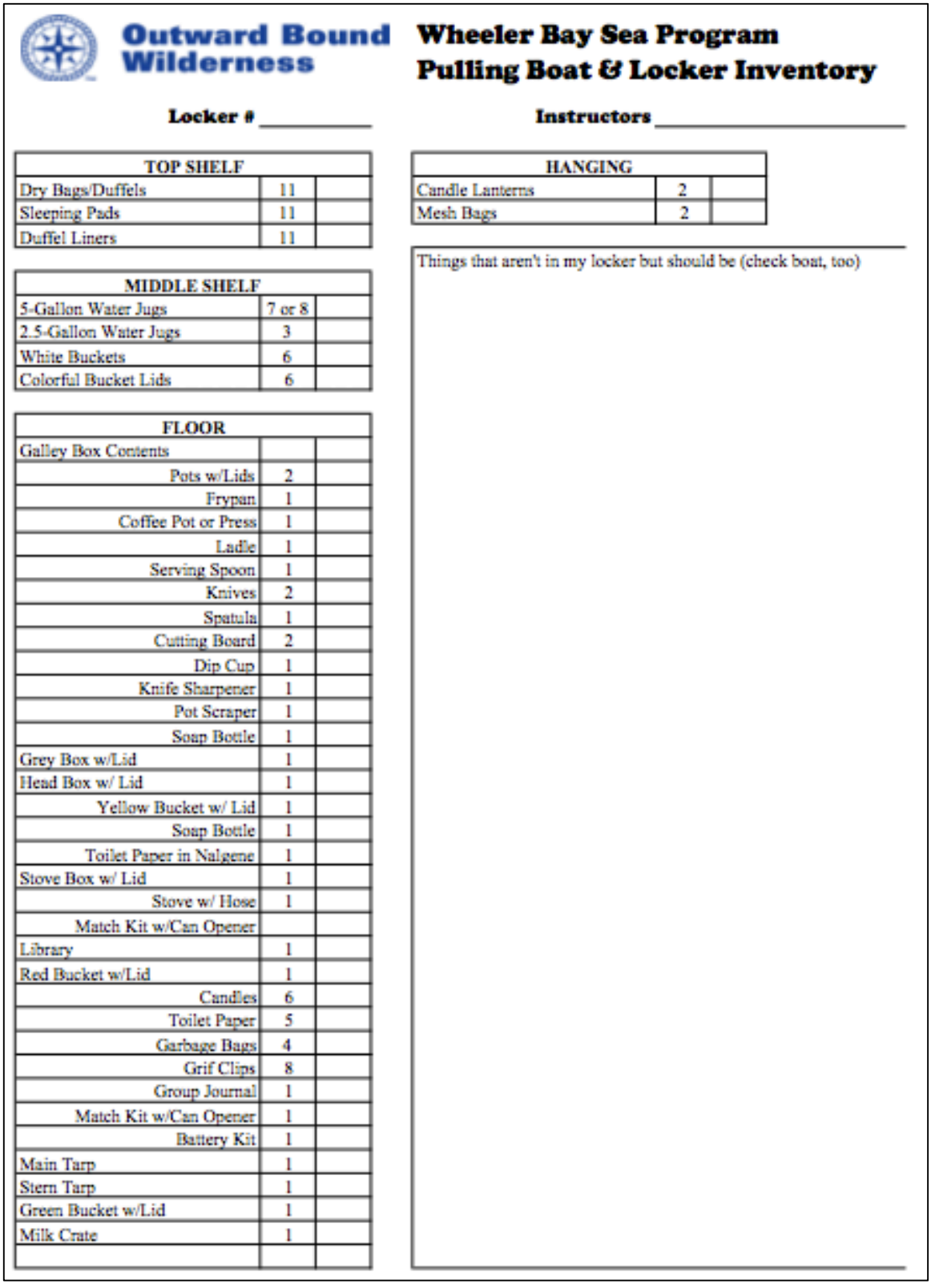
Dinner

1 Mac and Cheese (macaroni [1 C per person], cheese, moo, onions, broccoli, butter, parmesan)
1 Pasta Marinara (rotini [2 C per person], canned tomatoes, onions, peppers, parmesan)
1 Bulgar/Kidney Bean Chili (bulgar [1/4 C per person], kidney beans, tomato paste, onions, cheese)
1 Veggie/Tempeh Stir Fry (rice [1/2 C per person], tempeh, onions, carrots, cabbage, broccoli, soy sauce)
1 Black Bean Burritos (black beans, rice, tortillas [1.25 per person], salsa, onions, peppers, cheese)
0 Corn Chowder (canned corn, potatoes, onions, carrots, moo, butter, saltines)
1 Curried Lentil/Rice Stew (lentil-rice mix, onions, potatoes, carrots, celery)
0 Ramen (ramen, duh. [1 package per person])
1 Thai Peanut Pasta (rice noodles [2 pkg], peanut butter, soy sauce, honey, onions, peppers, broc, cabbage)
0 Minestrone Soup (rice, potatoes, onions, carrots, zucchini, chickpeas, kidney beans, canned tomatoes)
0 Tempeh Indonesian Soup (coconut milk, onions, green beans, tempeh, rice noodles)
1 Pumpkin Pasta (macaroni [1 cup per person], onions [2], garlic, pumpkin puree [2 cans], water, butter, cream cheese, vegeta

Snacks

1 Apples [1 per person]
1 Oranges [1 per person]
1 Bananas [1 per person]
2 GORP [1 C per person]
2 Trail Mix [1.5 C per person]
2 Dried Fruit (mixed) [1/4 C per person]
1 Graham Crackers [1/2 package per person]
1 Pretzels [1.5 C per person]
1 Granola Bars [1 per person]
1 Saltines [1/2 sleeve per person]
1 Ants on a Log (celery [1 bunch per patrol], peanut butter, raisins)

Figure A.7: Meal Guide



Outward Bound Wilderness

Wheeler Bay Sea Program
Pulling Boat & Locker Inventory

Locker # _____ **Instructors** _____

TOP SHELF		
Dry Bags/Duffels	11	
Sleeping Pads	11	
Duffel Liners	11	

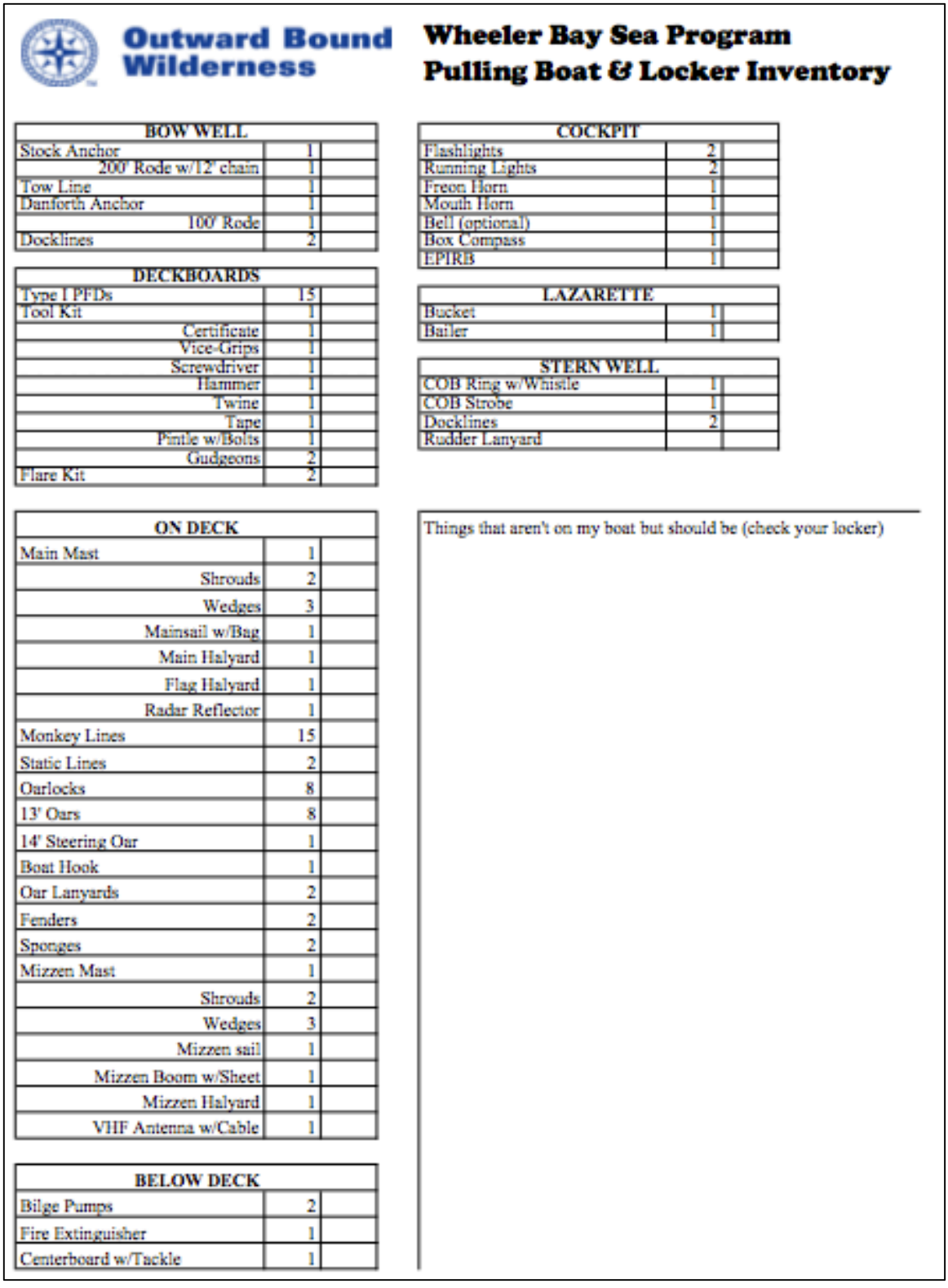
MIDDLE SHELF		
5-Gallon Water Jugs	7 or 8	
2.5-Gallon Water Jugs	3	
White Buckets	6	
Colorful Bucket Lids	6	

FLOOR		
Galley Box Contents		
Pots w/Lids	2	
Frypan	1	
Coffee Pot or Press	1	
Ladle	1	
Serving Spoon	1	
Knives	2	
Spatula	1	
Cutting Board	2	
Dip Cup	1	
Knife Sharpener	1	
Pot Scraper	1	
Soap Bottle	1	
Grey Box w/Lid	1	
Head Box w/ Lid	1	
Yellow Bucket w/ Lid	1	
Soap Bottle	1	
Toilet Paper in Nalgene	1	
Stove Box w/ Lid	1	
Stove w/ Hose	1	
Match Kit w/Can Opener		
Library	1	
Red Bucket w/Lid	1	
Candles	6	
Toilet Paper	5	
Garbage Bags	4	
Grif Clips	8	
Group Journal	1	
Match Kit w/Can Opener	1	
Battery Kit	1	
Main Tarp	1	
Stern Tarp	1	
Green Bucket w/Lid	1	
Milk Crate	1	

HANGING		
Candle Lanterns	2	
Mesh Bags	2	

Things that aren't in my locker but should be (check boat, too)

Figure A.8: Old locker inventory checklist



Outward Bound Wilderness

Wheeler Bay Sea Program
Pulling Boat & Locker Inventory

BOW WELL		
Stock Anchor	1	
200' Rode w/12' chain	1	
Tow Line	1	
Danforth Anchor	1	
100' Rode	1	
Docklines	2	

DECKBOARDS		
Type I PFDs	15	
Tool Kit	1	
Certificate	1	
Vice-Grips	1	
Screwdriver	1	
Hammer	1	
Twine	1	
Tape	1	
Pintle w/Bolts	1	
Gudgeons	2	
Flare Kit	2	

ON DECK		
Main Mast	1	
Shrouds	2	
Wedges	3	
Mainsail w/Bag	1	
Main Halyard	1	
Flag Halyard	1	
Radar Reflector	1	
Monkey Lines	15	
Static Lines	2	
Oarlocks	8	
13' Oars	8	
14' Steering Oar	1	
Boat Hook	1	
Oar Lanyards	2	
Fenders	2	
Sponges	2	
Mizzen Mast	1	
Shrouds	2	
Wedges	3	
Mizzen sail	1	
Mizzen Boom w/Sheet	1	
Mizzen Halyard	1	
VHF Antenna w/Cable	1	

BELOW DECK		
Bilge Pumps	2	
Fire Extinguisher	1	
Centerboard w/Tackle	1	

COCKPIT		
Flashlights	2	
Running Lights	2	
Freon Horn	1	
Mouth Horn	1	
Bell (optional)	1	
Box Compass	1	
EPIRB	1	

LAZARETTE		
Bucket	1	
Bailer	1	

STERN WELL		
COB Ring w/Whistle	1	
COB Strobe	1	
Docklines	2	
Rudder Lanyard		

Things that aren't on my boat but should be (check your locker)

Figure A.9: Old pulling boat inventory checklist

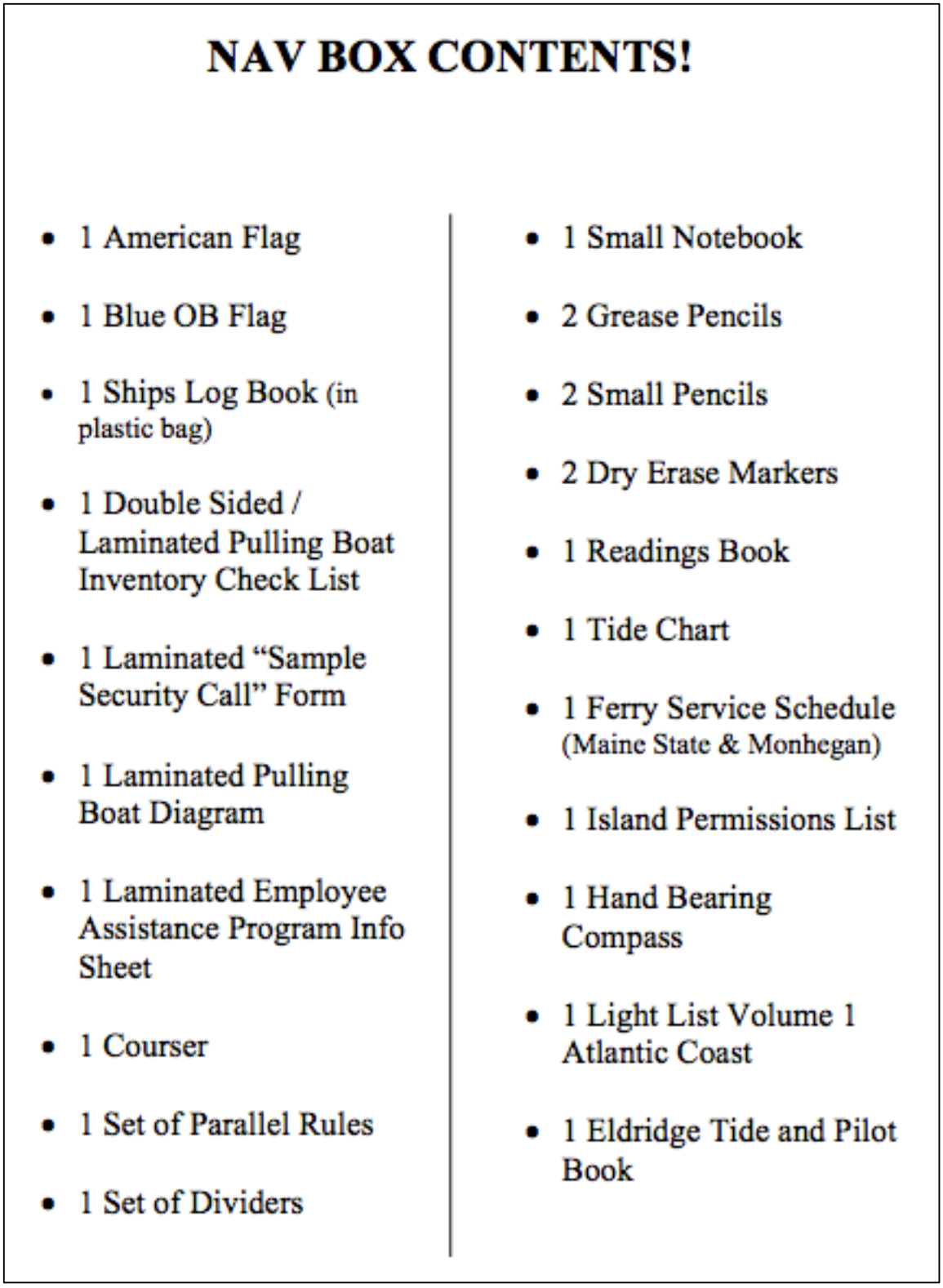


Figure A.10: Old nav box checklist

Wheeler Bay SEA PROGRAM PRE-COURSE INSTRUCTOR CHECKLIST 2017 7/5/17

COURSE #:

NAME:

TALK/DISCUSS

- ☐ Pre-course Briefing
- ☐ Meet w/ LC/CD early on day 1 of prep
- ☐ Instructor Check-ins w and w/o CD
- ☐ Goals/Roles/Expectations
- ☐ Course Start Flow
- ☐ Course End Flow: PCE, Banquet, flow
- ☐ Weather
- ☐ Chart talk
- ☐ 24 Hour plan
- ☐ 72 Hour plan
- ☐ Teaching Topics
- ☐ TMF
- ☐ Service
- ☐ Shipwreck/Group Solo
- ☐ SOLO/Mini SOLO
- ☐ BI Time- rox, rappel, and…
- ☐ Group Journal/Journal Time
- ☐ Plan for disbursement of Meds.
- ☐ Plan for permethrin treatment & tick talk
- ☐ Convoy discussion SWO STYLE/SMO
- ☐ CONSISTENCIES: Reefing, swim check, anchor watch, trash, night sailing, etc.

PAPERWORK

- ☐ Medicals
- ☐ Page Ones
- ☐ Timesheets
- ☐ ECG/Field Paperwork Packet
- ☐ Exped Plan (turned in to CD for approval)
- ☐ Curriculum
- ☐ new 2017 (green) Chapter 3 into BLABS
- ☐ Undisclosed Issues Form
- ☐ ***Pre-Expedition Safety Checklist***
- ☐ Copy of License USCG
- ☐ Pins

FOOD

- ☐ Submit Menu
  - ○ Resupplies
  - ○ Solo
  - ○ Night One Dinner
  - ○ Course End Meals
- ☐ Packout
- ☐ Spice Kit
- ☐ Get compost bucket → boat
- ☐ Fill buckets & grey bin → boat

BOAT PREP

- ☐ Read last entry of ship's log
- ☐ Complete boat inventory (list in Nav Box)
- ☐ Get a tarp from locker (check conditions) → boat
- ☐ Get propane from logistics → boat
- ☐ Stove check function
- ☐ Test EPIRB
- ☐ Fill water jugs

SUPPLY ROOM

- ☐ Check consumables bucket (list) → boat
- ☐ Check med & epi kit (list) → duffle shuffle
- ☐ Check comms box (list) → boat
  - ○ Test cell phone
  - ○ Test both VHFs
  - ○ Test GPS
  - ○ Take pic of course # with cameras
  - ○ Test charging kit
- ☐ Charts/Kit w/ bungees and whiteboard → boat
- ☐ Build library (instructors should customize, must include USCG Rules of the Road and Eldridge's) → boat
- ☐ Prep group journal → duffle shuffle
- ☐ Prep stuff bucket → duffel shuffle
  - ○ Add student handbooks

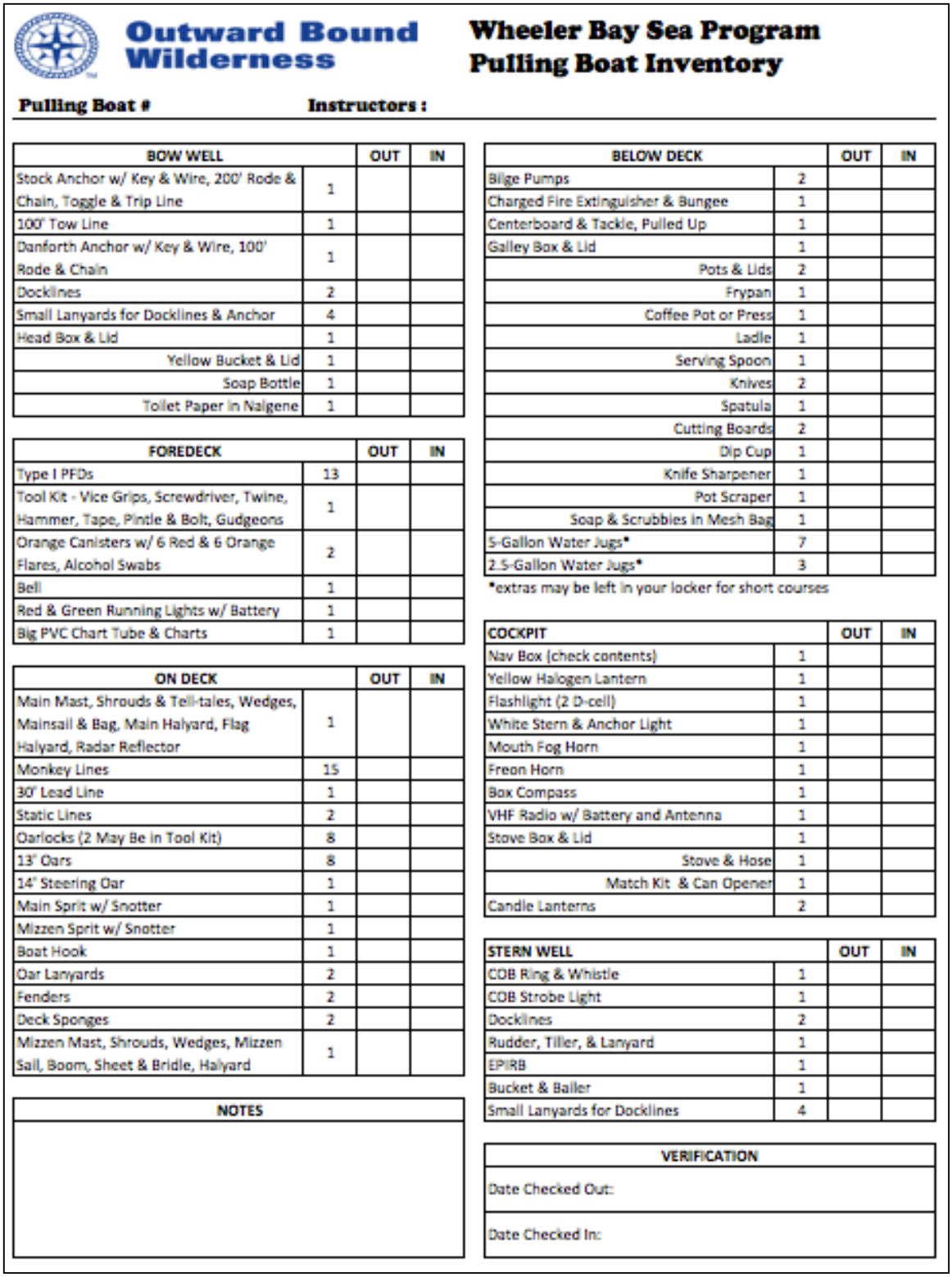
STUDENT GEAR ROOM

- ☐ Use checkout form
- ☐ Count duffel bags → duffel shuffle
  - ○ Duffel liners
  - ○ Sleeping bags
- ☐ Count & bag duffel straps → boat
- ☐ Count sleeping pads → duffel shuffle
- ☐ Stuff sacks? (available to help student organization) → duffle shuffle
- ☐ Fill bowl, mug and spoon bags → duffel shuffle
  - ○ Count bowls
  - ○ Count mugs
- ☐ Get water crate → duffle shuffle
- ☐ Whistles issued w/ PFDs during course start

OTHER

- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____

Figure A.11: Updated instructor prep checklist



Outward Bound Wilderness

Wheeler Bay Sea Program
Pulling Boat Inventory

Pulling Boat # **Instructors :**

BOW WELL		OUT	IN
Stock Anchor w/ Key & Wire, 200' Rode & Chain, Toggle & Trip Line	1		
100' Tow Line	1		
Danforth Anchor w/ Key & Wire, 100' Rode & Chain	1		
Docklines	2		
Small Lanyards for Docklines & Anchor	4		
Head Box & Lid	1		
Yellow Bucket & Lid	1		
Soap Bottle	1		
Toilet Paper in Nalgene	1		

FOREDECK		OUT	IN
Type I PFDs	13		
Tool Kit - Vice Grips, Screwdriver, Twine, Hammer, Tape, Pintle & Bolt, Gudgeons	1		
Orange Canisters w/ 6 Red & 6 Orange Flares, Alcohol Swabs	2		
Bell	1		
Red & Green Running Lights w/ Battery	1		
Big PVC Chart Tube & Charts	1		

ON DECK		OUT	IN
Main Mast, Shrouds & Tell-tales, Wedges, Mainsail & Bag, Main Halyard, Flag Halyard, Radar Reflector	1		
Monkey Lines	15		
30' Lead Line	1		
Static Lines	2		
Oarlocks (2 May Be in Tool Kit)	8		
13' Oars	8		
14' Steering Oar	1		
Main Sprit w/ Snotter	1		
Mizzen Sprit w/ Snotter	1		
Boat Hook	1		
Oar Lanyards	2		
Fenders	2		
Deck Sponges	2		
Mizzen Mast, Shrouds, Wedges, Mizzen Sail, Boom, Sheet & Bridle, Halyard	1		

NOTES

BELOW DECK		OUT	IN
Bilge Pumps	2		
Charged Fire Extinguisher & Bungee	1		
Centerboard & Tackle, Pulled Up	1		
Galley Box & Lid	1		
Pots & Lids	2		
Frypan	1		
Coffee Pot or Press	1		
Ladle	1		
Serving Spoon	1		
Knives	2		
Spatula	1		
Cutting Boards	2		
Dip Cup	1		
Knife Sharpener	1		
Pot Scraper	1		
Soap & Scrubbies in Mesh Bag	1		
5-Gallon Water Jugs*	7		
2.5-Gallon Water Jugs*	3		

*extras may be left in your locker for short courses

COCKPIT		OUT	IN
Nav Box (check contents)	1		
Yellow Halogen Lantern	1		
Flashlight (2 D-cell)	1		
White Stern & Anchor Light	1		
Mouth Fog Horn	1		
Freon Horn	1		
Box Compass	1		
VHF Radio w/ Battery and Antenna	1		
Stove Box & Lid	1		
Stove & Hose	1		
Match Kit & Can Opener	1		
Candle Lanterns	2		

STERN WELL		OUT	IN
COB Ring & Whistle	1		
COB Strobe Light	1		
Docklines	2		
Rudder, Tiller, & Lanyard	1		
EPIRB	1		
Bucket & Bailer	1		
Small Lanyards for Docklines	4		

VERIFICATION
Date Checked Out:
Date Checked In:

Figure A.12: Updated pulling boat inventory

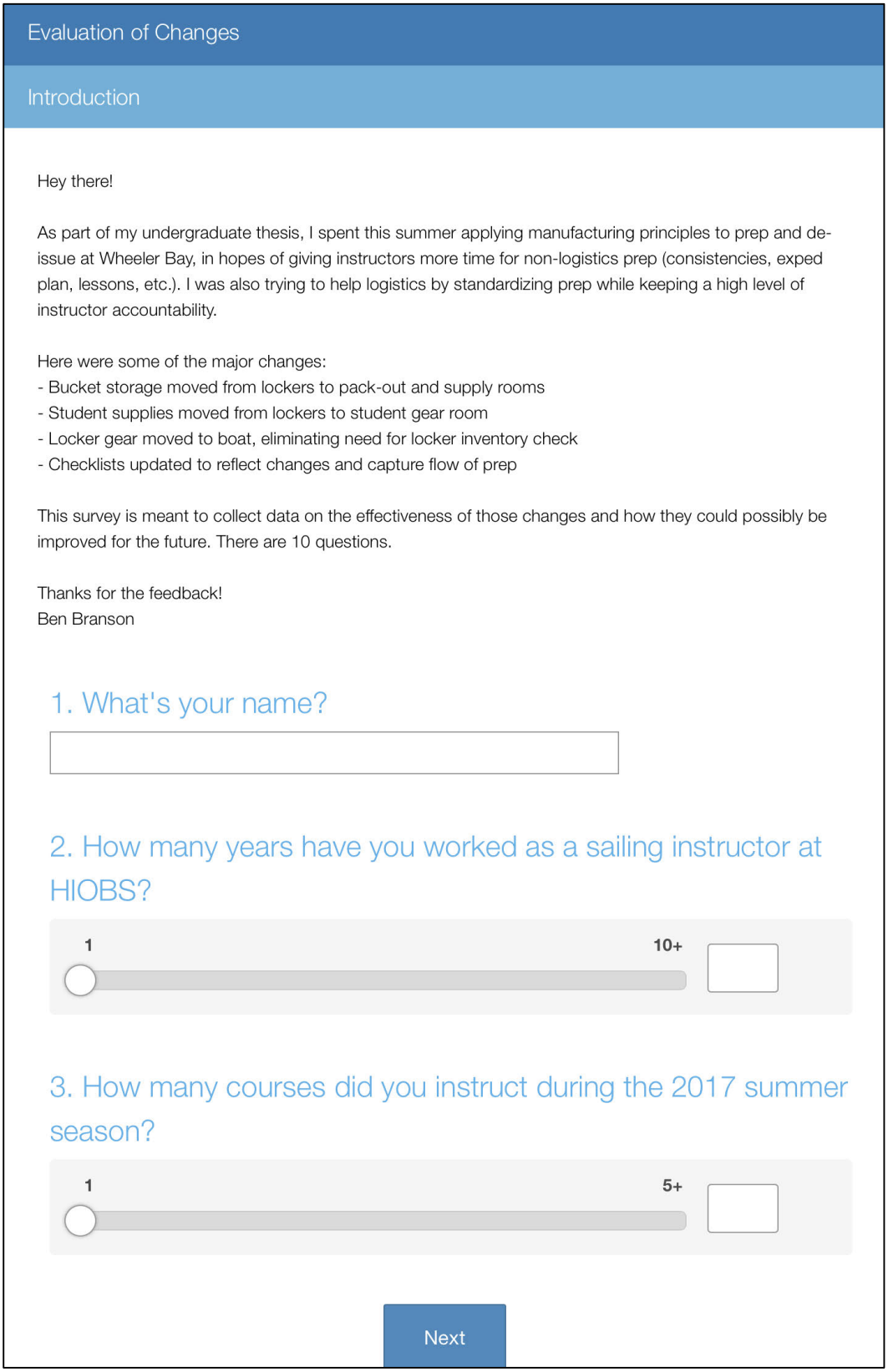


Figure A.13: End-of-season survey page 1

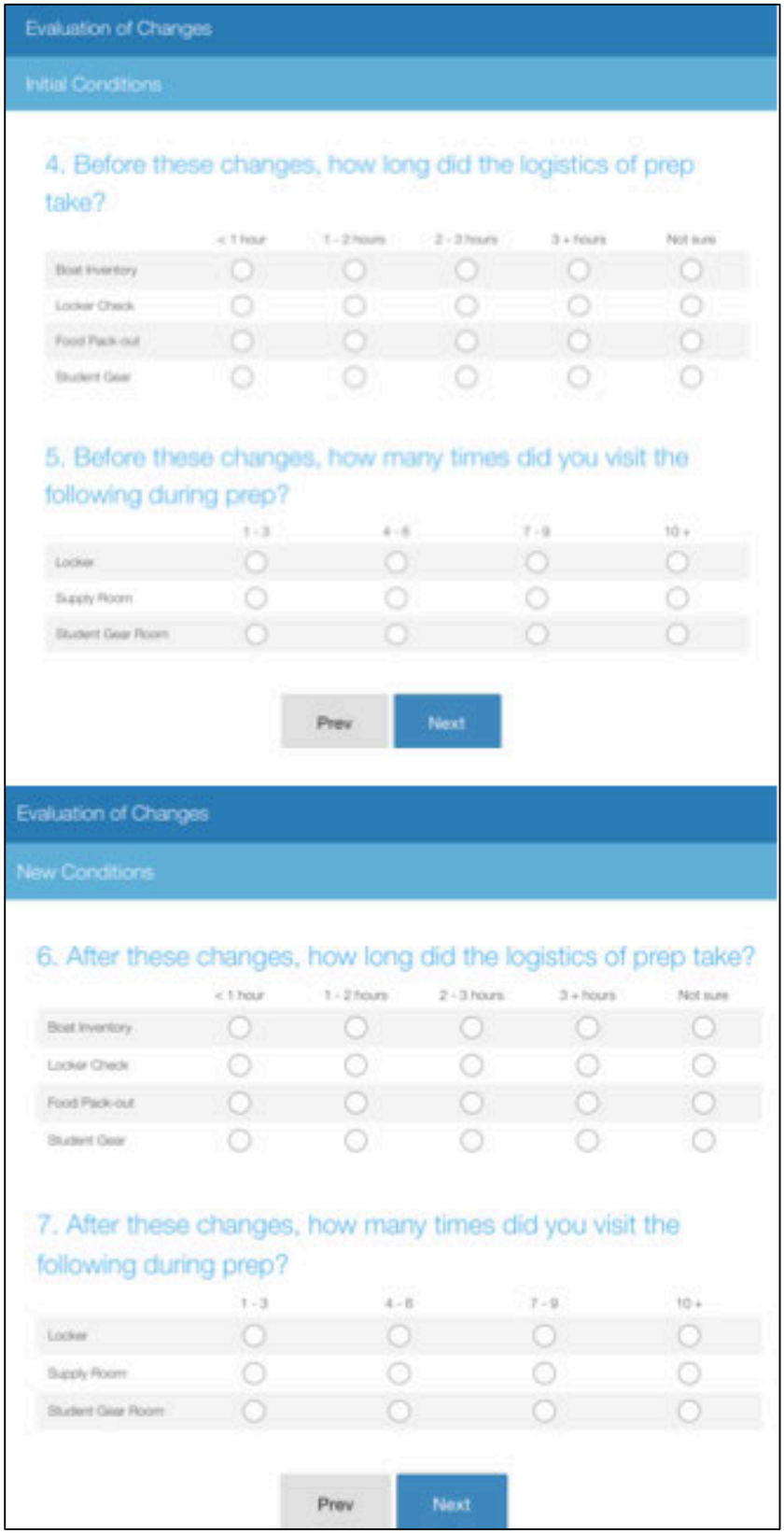


Figure A.14: End-of-season survey page 2

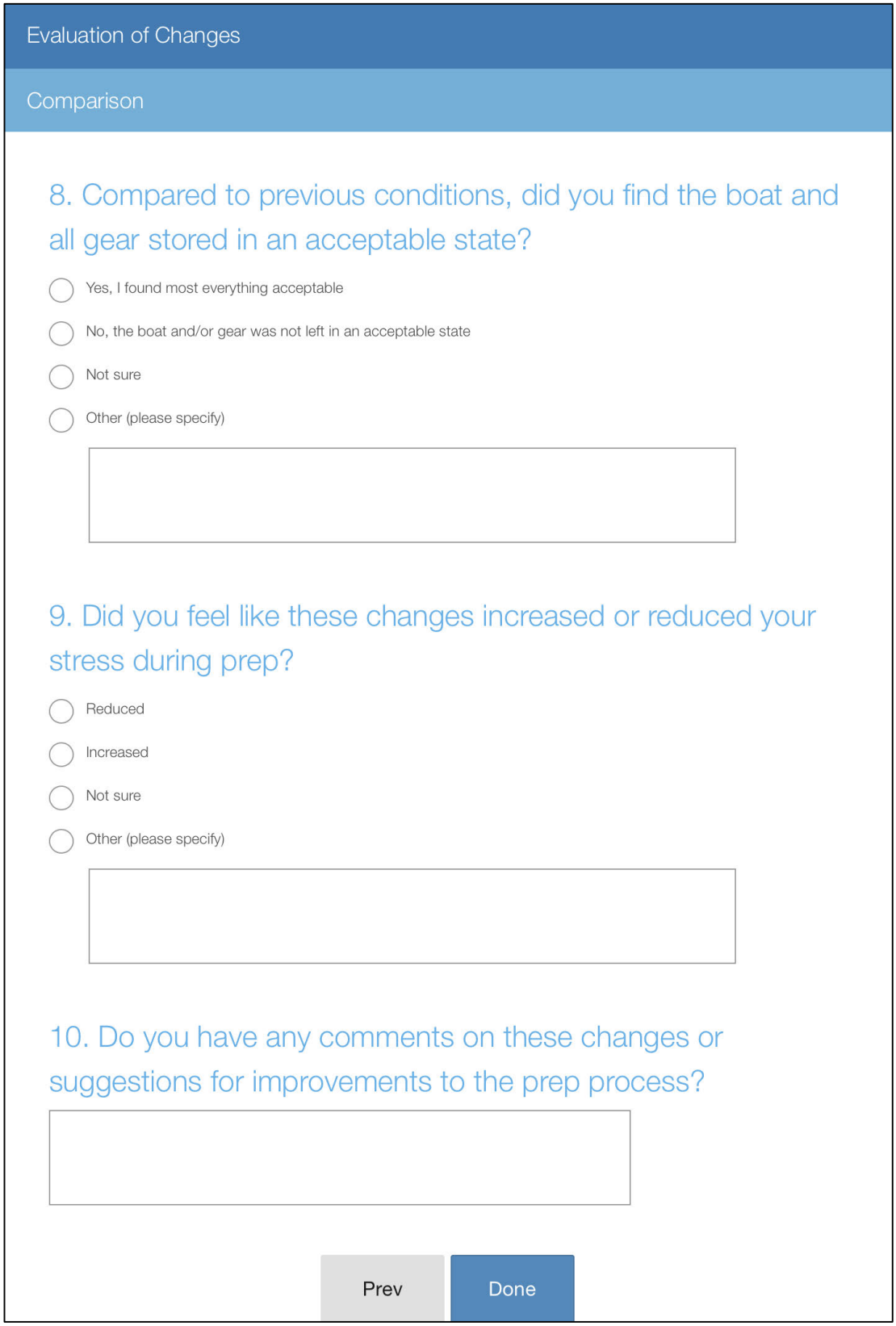


Figure A.15: End-of-season survey page 3

Table A.1: Complete survey responses

Identification			Time BEFORE [<1, 1-2, 2-3]				Visits BEFORE [1-3, 4-6, 7-9, 10+]			Time AFTER [<1, 1-2, 2-3]				Visits AFTER [1-3, 4-6, 7-9, 10+]		
Instructor	Years	Courses	Boat Prep	Locker Check	Food Packout	Student Gear	Locker	Supply Room	Student Gear	Boat Prep	Locker Check	Food Packout	Student Gear	Locker	Supply Room	Student Gear
1	2	3	1-2	1-2	2-3	1-2	4-6	4-6	4-6	<1	<1	1-2	<1	1-3	1-3	1-3
2	2	3	1-2	1-2	1-2	<1	4-6	1-3	4-6	1-2	<1	1-2	<1	1-3	1-3	1-3
3	10+	2	1-2	<1	2-3	<1	1-3	10+	1-3	1-2	<1	1-2	<1	1-3	7-9	1-3
4	1	3	no response				no response			1-2	<1	<1	1-2	1-3	1-3	1-3
5	10+	2	1-2	1-2	1-2	1-2	4-6	4-6	1-3	1-2	<1	1-2	<1	1-3	1-3	1-3
6	5	2	2-3	1-2	1-2	1-2	4-6	4-6	1-3	2-3	<1	1-2	1-2	1-3	4-6	1-3
7	5	1	2-3	<1	1-2	1-2	4-6	4-6	1-3	2-3	<1	2-3	1-2	1-3	1-3	1-3
8	10+	3	2-3	1-2	2-3	1-2	4-6	4-6	4-6	1-2	<1	1-2	<1	1-3	1-3	1-3
9	5	4	1-2	<1	2-3	<1	4-6	1-3	1-3	<1	<1	2-3	<1	1-3	1-3	1-3
10	5	2	1-2	1-2	2-3	1-2	7-9	7-9	4-6	1-2	<1	2-3	<1	1-3	4-6	4-6
11	7	3	1-2	<1	1-2	1-2	4-6	4-6	1-3	1-2	<1	1-2	1-2	1-3	4-6	1-3
12	10+	1	2-3	1-2	1-2	<1	4-6	1-3	1-3	1-2	<1	1-2	1-2	1-3	1-3	1-3
13	1	2	1-2	1-2	2-3	1-2	4-6	7-9	4-6	<1	<1	2-3	1-2	1-3	7-9	1-3

Table A.1 (continued): Complete survey responses

	Comparison		
Instructor	State Comparison	Stress	Improvements
1		no response	
2	acceptable	Overall reduced, but I felt stressed trying to get used to the new systems since I had just learned the old ones and hadn't gotten a full run down of the new system before my first course with the change	By the end of the season it felt very streamlined the way it was laid out. You asked about food prep- I do not remember any changes made so that it was simpler but would love it if there was a way.
3	acceptable	It increased, then reduced. I lost some productivity to having to look for things.	Consider re-organizing the checklist. See the course report from the mid September Adults course for comments from Ken and Jesse about this. Consider also re-organizing the gear room. Not sure if that is the most efficient layout or if we can change it somehow. Never thought about it. Some things went missing that we needed- namely the caps for the big blue barrels that we use for raft initiative about once every two years. And we need to fix the chart storage system. And it was extremely confusing figuring out where to put tarps. I'd also ask to see if logistics wound up putting away buckets more than before. I worry about that impact.
4	acceptable	reduced	I have worked for Outward bound for 12 years at many different bases. The prep days at Wheeler Bay were the least stressful and the most productive of any base i have ever worked at
5	acceptable	reduced	I love the changes! They are welcomed. It's great to have fresh ideas and perspective. No it made our jobs easier. Hands down.
6	acceptable	similar	Relocation of gear is useful. For me, it may or may not have increased time efficiency. Here's my typical prep workflow: 1)Tasks which relate to obligations to others and/or have deadlines, 2)Big tasks, 3)Technical tasks and tasks which require problem-solving, 4)Small simple tasks.
7	acceptable	reduced	
8	acceptable	reduced	The changes were brilliant. I never understood why we hauled all that gear back and forth. Thank you.
9	acceptable	reduced	Nope! I love the new system!! Thanks Ben!
10	acceptable	Prep for my first course was a hot mess because it was early in the season and the boat and locker were not any kind of ready (but we got an extra day to get it together which was amazing). Second course prep was smooth like buttah, having been on the same boat three days prior definitely made things a lot easier. There was some getting used to the new systems, but I think in the long run, it will be a much more efficient way of prepping.	So thankful for your work!
11	acceptable	increased	Re q 9: Change is hard, and not finding gear where you're used to finding it is stressful. But overall the changes do save time in moving stuff around, so the stress of change will ease as we get used to everything's new spot. I feel like there were some confusing arrows depicting flow (i.e. to duffel shuffle?) that was hard to understand/explain for new staff--simplify the checklist by taking out the locations/arrows to accommodate diversity in flow. Haha or not, gee wiz that sounds silly.
12	acceptable	No real reduction in stress for me. I appreciated the thought and process. I enjoyed being able to talk about the changes with other people and in that, thinking about other improvements.	Can't wait to see what happens next year in terms of the food packing system! Thanks for all your hard work!
13	acceptable	reduced	oh, lots.

Field Equipment															
Item	Vendor	Model	$ Per Item	Life Span	Current Inventory	Inventory Needed	Last Year Ordered	Buy every x years	# Retired	2017	Replace and retire	Next year to buy	Price	Month	
Anchor Lights	Colman		$ 30.00	3	10	10	2016	1	3	3	3	2018	$ 90.00	FLORIDA	
Beam Gun	misc		$ 35.00	2	10	10	2016	1	5	5	5	2018	$ 175.00	FLORIDA	
Luci Lantern	Mpowered		$ 7.60	2	20	10	2016	1	5	5	-5	2018	$ (38.00)	FLORIDA	
Sleeping Bags	Wiggy (ultra light)		$ 107.00	15	110	110	2016	1	7	7	7	2018	$ 749.00	June	
Nalgenes	ThermoFisher		$ 5.00	3	60	60	2016	1	20	20	20	2018	$ 100.00	June	
Library	misc		$ 25.00	12	120	120	2016	1	10	10	10	2018	$ 250.00	June	
Buckets	Uline	S-7914 (5 gal plastic ;	$ 5.05	10	80	90	2016	2	18	0	10	2018	$ 50.50	June	
Bucket lid	Uline	S-17945 (Gamma sea	$ 9.00	10	80	90	2000	2	18	18	28	2019	$ 252.00		
Gray box	Uline	S-19694 (Stack & nes	$ 34.00	10	10	10	2000	2	2	2	2	2019	$ 68.00		
Gray box lid	Uline	S-19694L (Stack & ne	$ 14.00	10	10	10	2000	2	2	2	2	2019	$ 28.00		
Large water jug	Uline	S-17471 (5 gal jerrica	$ 18.00	10	60	70	2000	2	14	14	24	2019	$ 432.00		
Grease pencil	Uline	S-17462 (China mark	$ 0.95	1	10	20	2016	1	20	20	30	2018	$ 28.50		
Galley Pot	webstaurantstore.com		$ 40.00	10	20	20	2016	1	2	2	2	2018	$ 80.00	June	
Knives	misc		$ 20.00	2	20	20	2016	1	10	10	10	2018	$ 200.00	June	
Galley Fry Pans	webstaurantstore.com		$ 30.00	10	10	10	2016	2	2	0	0	2018	$ -	June	
Foul Weather Gear	Hamilton, HH		$ 70.00	8	110	130	2016	1	16	16	36	2018	$ 2,520.00	October	
Dry Duffle Bags	NRS		$ 60.00	7	88	110	2016	1	16	16	38	2018	$ 2,280.00	May	
WB Base Stoves (Fie	Camp Chef		$ 100.00	8	11	5	2016	1	1	1	-5	2018	$ (500.00)	May	
General Nav Equipm	Hamilton		$ 20.00	5	10	10	2015	1	2	2	2	2018	$ 40.00	May	
Plastic Bowls	Liberty Mountain		$ 2.00	4	90	110	2016	1	28	28	48	2018	$ 96.00	June	
PFDs	Extrasport Riverine		$ 52.00	4	120	130	2013	2	65	65	75	2019	$ 3,900.00	June	
Sleeping Pad	Sierra Designs	**Classic Ridge Rest**	$ 18.00	7	88	110	2016	1	16	16	38	2018	$ 684.00	May	
Dry Bag	Sierra Designs	**Sealine Baja 30L**	$ 30.00	10	34	0	2016	2	0	0	-34	2018	$ (1,020.00)	September	
Dry Boxes	Pelican Cases (various)		$ 15.00	5	35	35	2016	1	7	7	7	2018	$ 105.00	June	
Hand Bearing Compa	Hamilton	Plastismo 23117 Iris !	$ 105.00	6	5	10	2015	3	5	0	5	2018	$ 525.00	FLORIDA	
Binoculars	Hamilton		$ 200.00	15	10	10	2015	3	2	0	0	2018	$ -	June	
Solo Bug Tarps	Wenzel		$ 40.00	5	15	22	2012	1	4.4	4	11	2018	$ 440.00	FLORIDA	
Life Guarding Books															
Helmets															
Harnesses															
Head lamps															
Charts															

Figure A.16: Inventory life cycle plan

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